THE JOURNAL OF GAS LIGHTING
WATER SUPPLY & SANITARY IMPROVEMENT

VOL. LXXXIX. No. 2179.] LONDON, FEBRUARY 14, 1905. [57TH YEAR. PRICE 6d.

PARKER & LESTER,

— *ESTABLISHED 1830.* —

MANUFACTURERS AND CONTRACTORS. **ORMSIDE STREET, LONDON, S.E.**

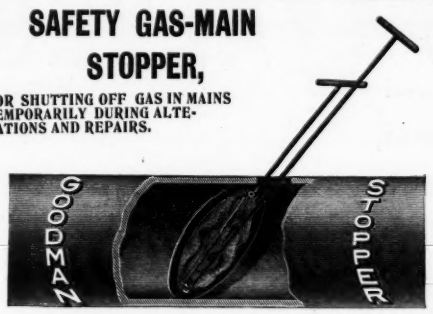
THE ONLY MAKERS OF

PATENT ANTIMONY PAINT & PARKER'S IMPERIAL BLACK VARNISH.

OXIDE PAINTS, OILS, AND GENERAL STORES, FOR GAS AND WATER WORKS.

SAFETY GAS-MAIN STOPPER,

FOR SHUTTING OFF GAS IN MAINS TEMPORARILY DURING ALTERATIONS AND REPAIRS.

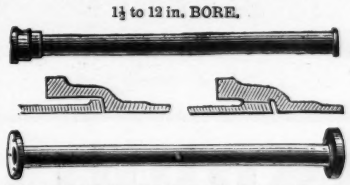


GAS-LEAK INDICATOR.

PRICES AND PARTICULARS ON APPLICATION.

GAS AND WATER PIPES

1½ to 12 in. BORE.



THOMAS ALLAN & SONS, LIMITED,

Bonlea Foundry,

THORNABY-ON-TEES.

Formerly Springbank Iron-Works, Glasgow.

ESTABLISHED 1848.

Also Manufacturers of

SANITARY AND RAIN-WATER PIPES, HOT WATER PIPES, STABLE FITTINGS, RANGES, STOVES, AND GENERAL CASTINGS.

Telegrams: "BONLEA, THORNABY-ON-TEES."

CARLESS, CAPEL & LEONARD,

HOPE CHEMICAL WORKS, HACKNEY WICK, LONDON, N.E.,

And at Pharos Works, Hackney Wick.

NAPHTHA AND GASOLINE DISTILLERS AND PETROLEUM IMPORTERS,

Specially distil Carburine Spirit, specific gravity ·680, or of any other grade suitable for Enriching Gas; also Gas Oil best adapted for injecting into the Retorts, as in the Herring Process.

Importers of Petroleum for Carburetting Water Gas, or for Manufacturing Oil Gas. Distillers of Pentane, Petroleum Ether, and Naphtha for clearing the pipes of Naphthaline, &c.

Samples and Prices may be had on application.

13,000

FURNACES

FITTED.

CHEAP STEAM PRODUCTION.

TO THE EDITOR OF ENGINEERING.

SIR,—Some years ago we attached forced draught and special fire-bars to our two Lancashire boilers, with the object of burning coke dust. The load has grown, and last week I had the water and fuel carefully checked, with the following results:—

Water used in boilers from Dec. 9 to Dec. 16, as per Corporation meter .	79,300		
Fuel used from Dec. 9 to Dec. 16:	£	s.	d.
Coke dust—41 tons 4 cwt., at 1s. 11d. .	3	19	0
Washed slack—15 tons 17 cwt., at 6s. 6d.	5	3	2
	£9	2	2

This works out at a fraction under 2s. 4d. per 1000 gallons. Can this result be beaten? I may add that the water-feed to the boilers is heated by the exhaust steam from the engines to 200 deg.

Yours truly,
C. D. LENG.

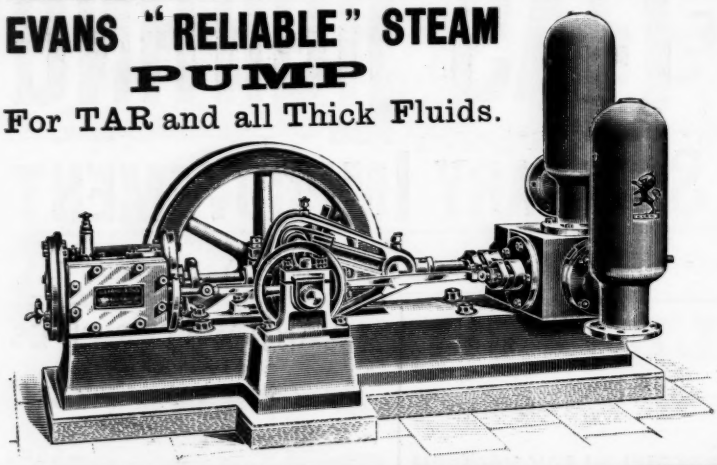
High Street, Sheffield, Dec. 19, 1904.

FOR FURTHER PARTICULARS APPLY—

MELDRUM BROS., LTD., TIMPERLEY, MANCHESTER; AND 66, VICTORIA STREET, WESTMINSTER.

EVANS "RELIABLE" STEAM PUMP

For TAR and all Thick Fluids.



FIRST AWARDS EVERYWHERE.

Write for No. 8 Catalogue.

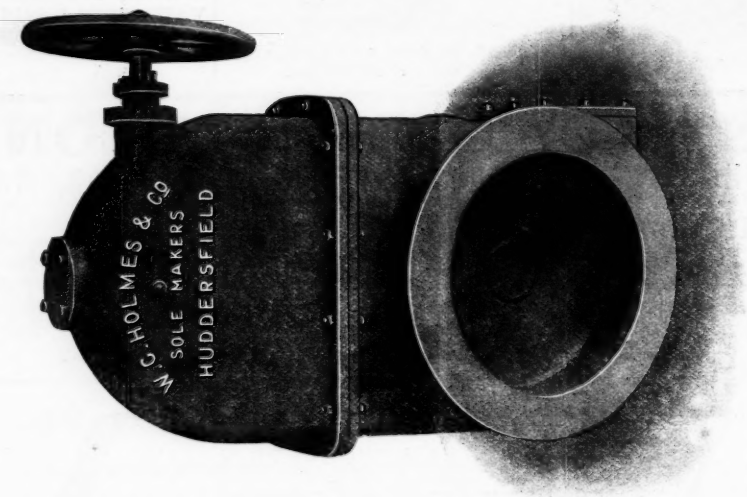
Telegrams:
"EVANS, WOLVERHAMPTON."
National Telephone No. 39.
London Office,
SALISBURY HOUSE, LONDON WALL, E.C.

JOSEPH EVANS & SONS,
CULWELL WORKS,
WOLVERHAMPTON.

DOUBLE FACED VALVES

"WESTERN" TYPE,

MADE IN HORIZONTAL OR VERTICAL FORM from 3 in. to 48 in.



W. C. HOLMES & Co., HUDDERSFIELD.

HIGHEST AWARDS—LONDON, PARIS, COLOGNE, VIENNA, MELBOURNE, AND OTHERS.

—11 MEDALS.—

MANUFACTURERS OF TUBES AND FITTINGS OF EVERY DESCRIPTION.

WROUGHT-IRON OR STEEL MAINS UP TO 6 FEET DIAMETER FOR GAS, WATER, OIL, OR OTHER PURPOSES.

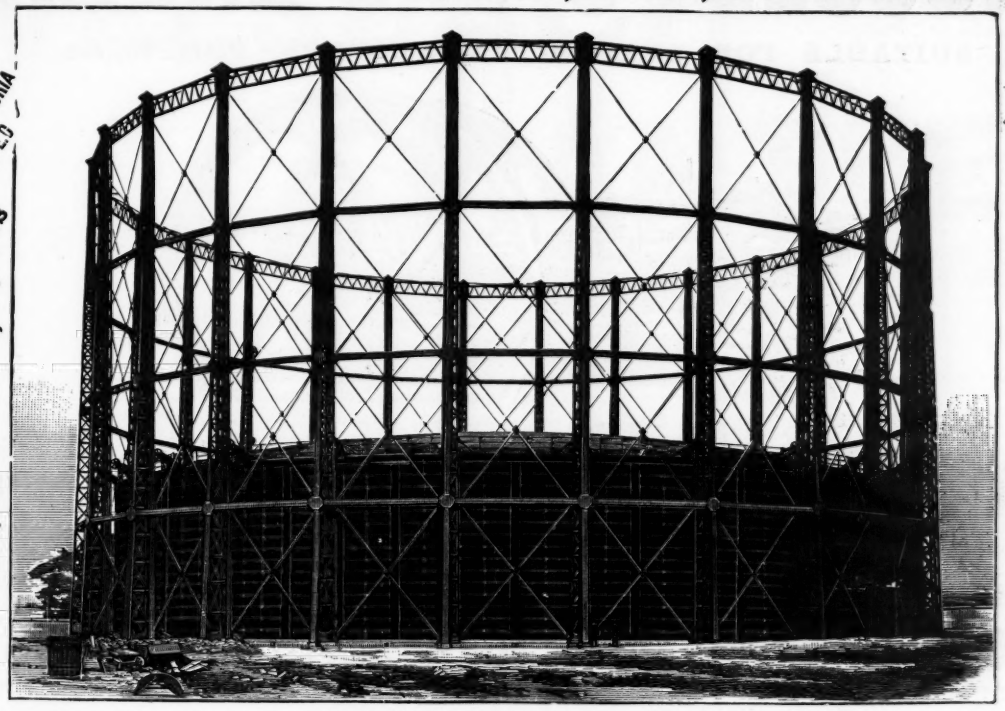
SCREWING TACKLE, BOILER MOUNTINGS, VALVES, COCKS, ETC.

LONDON: 108, Southwark Street. **MANCHESTER:** 33, King Street West. **BIRMINGHAM:** 114, Colmore Row. **LEEDS:** 6, Mark Lane, New Briggate.

THOMAS PIGGOTT & CO., LTD., BIRMINGHAM.

LONDON OFFICE
83, QUEEN VICTORIA STREET, E.C.

GAS PLANTS
BOILERS,
ENGINES,
PUMPS,
ROOFS,
RETORT.
FITTINGS.
ETC.



TELEGRAPHIC ADDRESS: ATLAS BIRMINGHAM

WELDED & RIVETED PIPES FOUL MAINS. RETORT. LIDS, WROT & CAST TANKS. PURIFIERS.

MANUFACTURERS OF

Humphreys & Glasgow's Carburetted-Water-Gas Plant

INSTALLATIONS HAVE ALREADY BEEN ADOPTED WITH AN AGGREGATE CAPACITY OF **152,800,000** CUB. FT. DAILY.

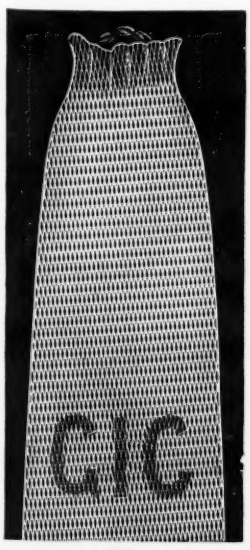
HARRIS & PEARSON,

STOURBRIDGE, ENGLAND,

MANUFACTURERS OF

FIRE-CLAY GAS-RETORTS, FIRE-BRICKS, LUMPS, & TILES of Every Description.

GLAZED BRICKS AND PORCELAIN BATHS.



NINETEEN O FIVE

REDUCE YOUR MAINTENANCE BILLS.

AN UNPRECEDENTED OFFER, FOR ONE MONTH ONLY.

We will send Carriage Paid to any **GAS COMPANY** or **LIGHTING AUTHORITY** in **GREAT BRITAIN** a trial gross of pure Ramie **"C"** Mantles, guaranteed first quality, at **24s.** net.

(Mantles are unstamped and in plain boxes).

We will also at the same time send **ESPECIALLY LOW QUOTATIONS FOR 7, 14, 21, & 100 GROSS LOTS.**

N.B.—We cannot give free Samples of this Mantle, and the supply is limited.

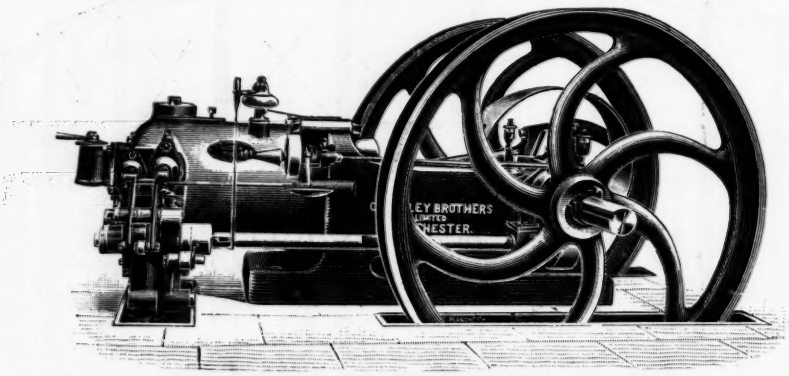
PLEASE WRITE AT ONCE TO

The GENERAL INCANDESCENT COMPANY, Ltd.,

Telegrams: "ASABLAZO, LONDON." **CITY ROAD, FINSBURY, LONDON, E.C.** Telephone: No. 9536 London Wall.

CROSSLEY'S GAS-ENGINES

SUITABLE FOR DRIVING EXHAUSTERS, PUMPS, &c.



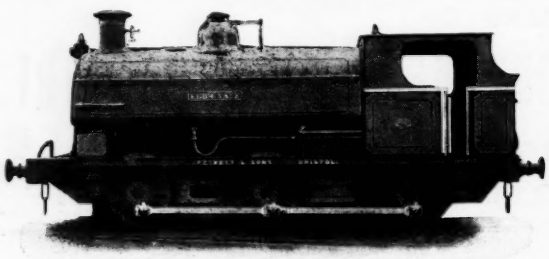
Represents "XA" Type giving 60 Effective Horse Power.

ENGINES DELIVERED—Up to the end of 1903, 48,839 Engines have been delivered representing 701,700 B. H.P.

IMMEDIATE DELIVERY FOR STOCK SIZES OF ENGINES.

Large Number of Second-Hand Engines always in Stock.

CROSSLEY BROS., LTD., OPENSHAW, MANCHESTER.



LOCOMOTIVES

LOCOMOTIVES of all Sizes and Gauges specially constructed for Main and Branch Lines, Contractors, Docks, Gas-Works, Collieries, Iron-Works, Brick and Cement Works, &c. Locomotives of various Sizes always in Stock, ready for immediate delivery.

Photographs, Specifications, and Prices on Application.

PECKETT & SONS, Atlas Locomotive Works, BRISTOL.

Telegraphic Address: "PECKETT, BRISTOL."

NEWTON, CHAMBERS, & CO.,

LIMITED.

THORNCLIFFE IRON-WORKS, near SHEFFIELD.

Established 1790

LONDON OFFICE: **19, Great George Street, WESTMINSTER.**

Telegraphic Addresses, "NEWTON, SHEFFIELD," "ACCOLADE, LONDON."

GAS ENGINEERS, IRONFOUNDERS, and CONTRACTORS.

MANUFACTURERS OF EVERY DESCRIPTION OF

PLANT, APPARATUS, AND MACHINERY FOR GAS AND CHEMICAL WORKS.
RETORTS AND FITTINGS, MOUTHPIECES WITH SELF-SEALING LIDS.
IMPROVED COAL AND COKE HANDLING PLANT, CONVEYORS, AND ELEVATORS.
CONDENSERS, SCRUBBERS, AND WASHERS.

PURIFIERS with Planed Joints a Speciality.

PATENT CENTRE-VALVES, RACK AND SCREW VALVES, WOOD GRIDS AND SCRUBBER-BOARDS, CAST-IRON MAINS, AND SPECIALS.
STRUCTURAL WORK, COLUMNS, GIRDERS, AND ROOFING.
GASHOLDERS, CAST-IRON OR STEEL TANKS.

DESIGNS, SPECIFICATIONS, and ESTIMATES FREE.

PIG IRON (SPECIAL QUALITY) for Engine Cylinders. GAS COAL famous for its Unrivalled excellence.

WELSBACH MANTLES

Registered **A.U.R.** Trade Mark.

SWEEPING REDUCTIONS

On the 1st of JANUARY, 1905,

IN THE PRICES OF

WELSBACH "C" & PLAISSETTY MANTLES

TO THE GAS TRADE.

Welsbach Mantles are BRITISH MADE THROUGHOUT by British Labour, and carry the usual Warranty of replacement.

There are no Mantles so good as Welsbach.

WRITE FOR FULL PARTICULARS OF NEW PRICES.

THE

WELSBACH INCANDESCENT GASLIGHT CO., LIMITED,

2 to 14, Palmer Street, **WESTMINSTER, S.W.**

Telegrams: "WELSBACH, LONDON." *Telephone: 290 WEST.*

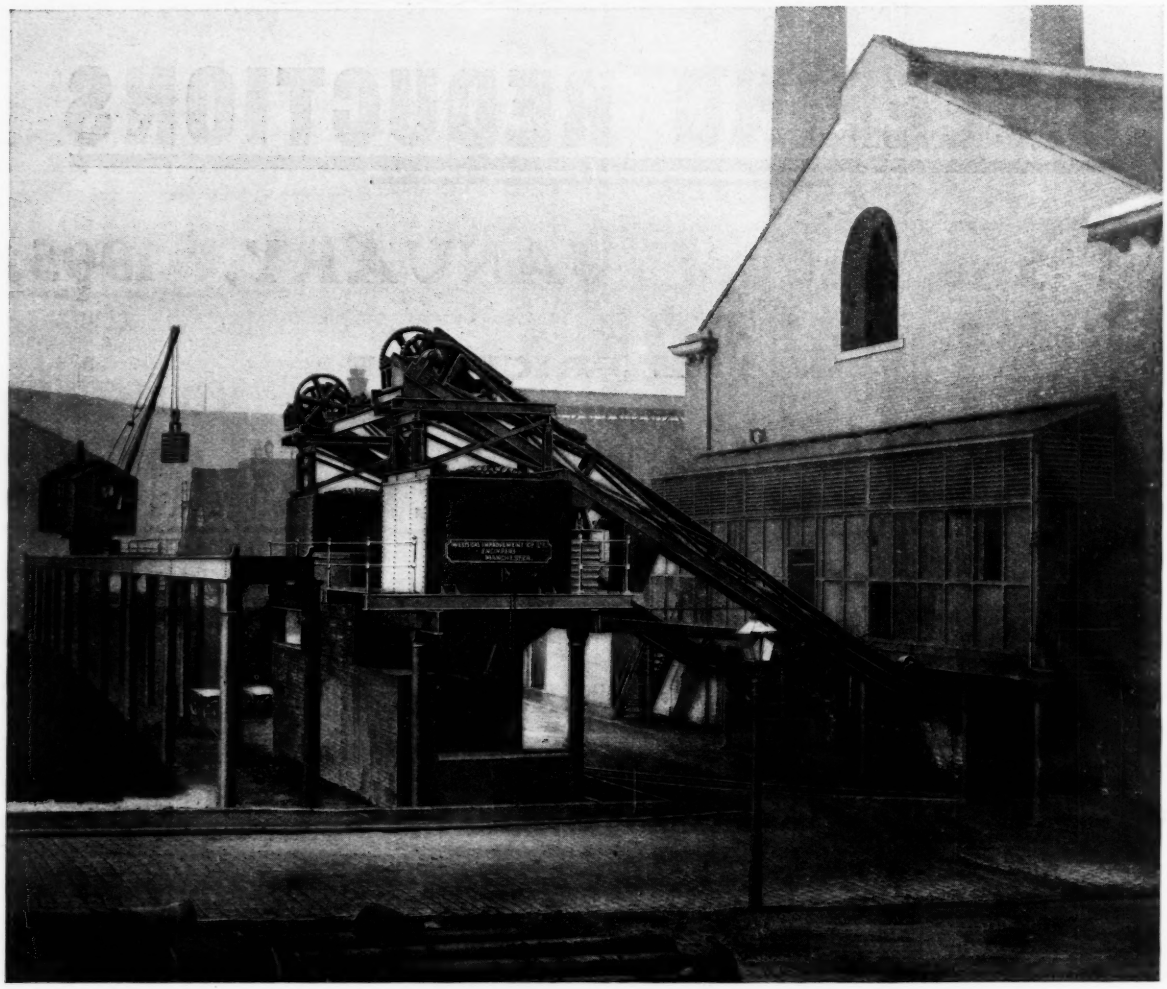
ALBION IRON WORKS,
MILES PLATTING,

MANCHESTER.
TELEGRAMS—
"STOKER, MANCHESTER."

WEST'S GAS IMPROVEMENT CO., LD.

Gas and General Engineers.

CONTRACTORS FOR
COMPLETE RETORT-HOUSE PLANT
. . EITHER ON : . .
THE HORIZONTAL OR INCLINED SYSTEMS.



Photograph showing West's Coke-Conveyor dealing with the Coke from Nineteen Through Beds of Retorts.

WEST'S IMPROVED PATENT HOT-COKE CONVEYOR,

With Special Chain constructed with a minimum number of parts, and having Large Joint Pins with ample Bearing Surfaces.

WEST'S STOKING MACHINERY— COMPRESSED AIR DRIVEN AND MANUAL SYSTEMS

COAL BREAKING, ELEVATING, & STORING PLANTS.

BELTON'S PATENT AUTOMATIC RELIEF APPARATUS FOR HYDRAULIC MAINS.

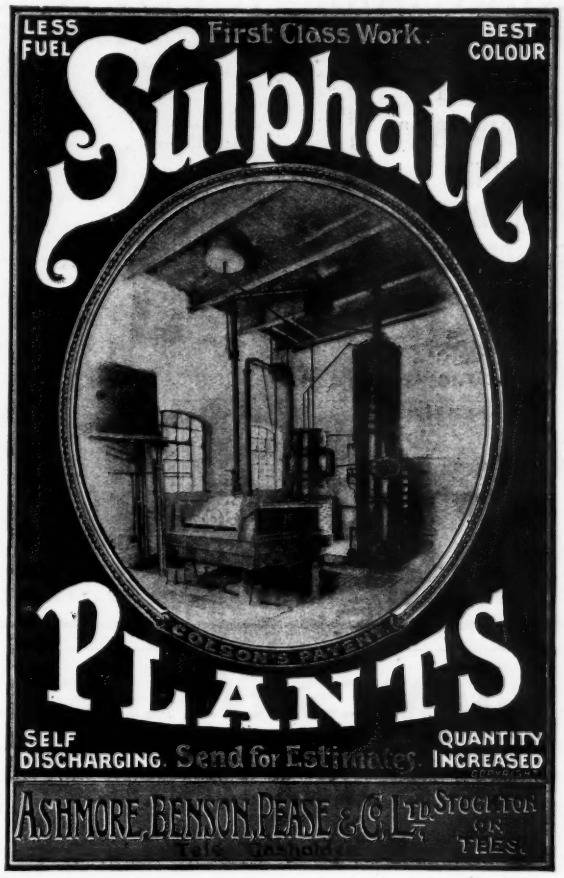
Manufacturers for America : Riter-Conley Manufacturing Company, Pittsburg.

PUBLIC LIGHTING.

The Cluster of Veritas-Celestra Lamps reproduced in illustration was one of the most successful Exhibits installed in the grounds at Earl's Court, during the recent Gas Exhibition.

Correspondence invited from Lighting Authorities, to whom Illustrated descriptive List will be posted free on application.

FALK, STADELMANN, & CO.,
— LIMITED, —
83, 85, & 87, Farringdon Road, London, E.C.



ARROL-FOULIS
Patent Automatic Machinery
FOR
DRAWING AND CHARGING GAS-RETORTS.

Full Particulars may be obtained from the Sole Makers,
SIR WILLIAM ARROL & CO., Limited,
GLASGOW.
[See Illustrated Advertisement, Feb. 7. p. 334.]

TIMMIS'S PATENT
CLINKERING DOOR.

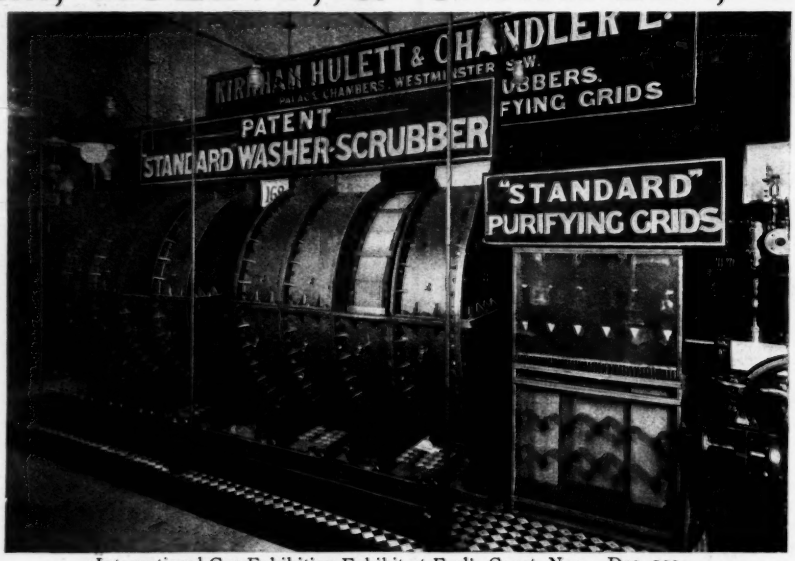
For Illustrated Advertisement, with full Particulars, see "JOURNAL" for Feb. 7, p. 392.

GEO. H. TIMMIS,
River Stour Works, STOURBRIDGE.
Telegrams: "TIMMIS, LYE." National Telephone: 13, LYE.
or of **HARPER & MOORES, LTD.,**
STOURBRIDGE.

KIRKHAM, HULETT, & CHANDLER, LIMITED,

PATENT "STANDARD" COMBINED CONDENSER & SCRUBBER.

Slow Speed, Large Area for Gas, Water, and Liquor. High Strength Liquor obtained.



PATENT "STANDARD" TAR-WASHERS.

Easy access to Interior without disturbing the Connections, small ground area required.

International Gas Exhibition Exhibit at Earl's Court, Nov.—Dec. 1904.

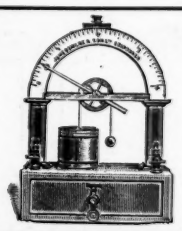
PALACE CHAMBERS, BRIDGE STREET, WESTMINSTER, S.W.

JAMES MILNE & SON, LTD.,

GAS ENGINEERS

MILTON HOUSE WORKS EDINBURGH.

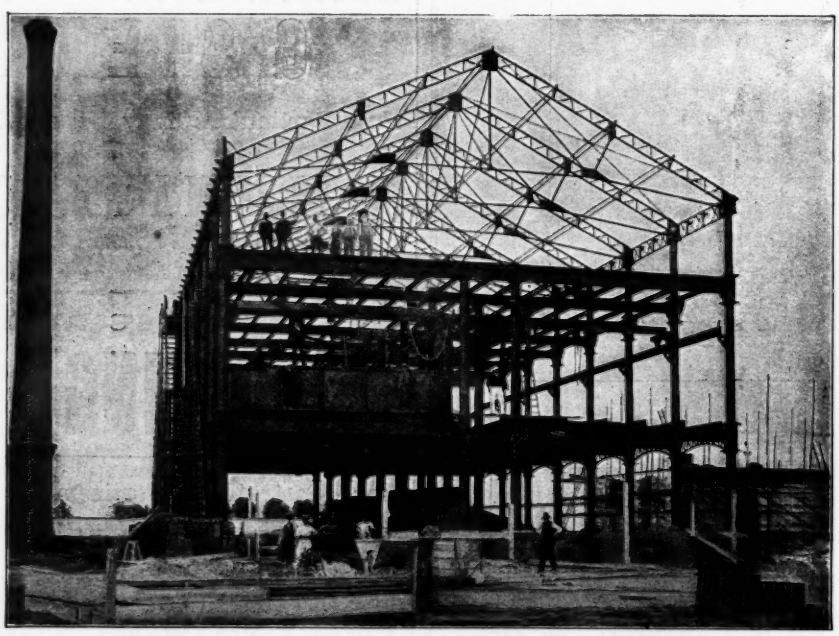
LONDON. —— LEEDS. —— GLASGOW.



THE WHESSOE FOUNDRY CO., LTD.

Works: DARLINGTON.

MAKERS OF EVERY DESCRIPTION OF GAS PLANT.



GASHOLDERS AND DRY-SEAL PURIFIERS A SPECIALITY.

PHOTO. OF STAGE-FLOOR PURIFIER-HOUSE TAKEN DURING ERECTION FOR THE UNION DES GAZ AT THEIR WORKS NANTERRE, PARIS.

London Office: 106, CANNON STREET, E.C.

ARDEN HILL & Co's
"ACME"
GAS FIRES

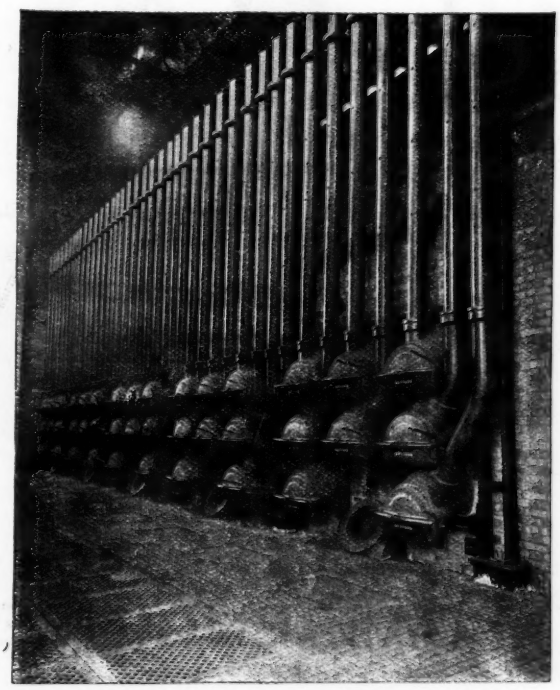
"ACME" WORKS, BIRMINGHAM.

INCLINED RETORTS.

WE
make every single part of the Installation in our own Works at

RETFORD,

Including the Roofs, Coal Tippers, Coal Breakers, Coal Elevators, Coal Conveyors, Hot Coke Conveyors and Screening Plants, Retort Mouthpieces with Self-Sealing Lids, Stage Floors, Foul and Hydraulic Mains, Ascension, Arch, and Dip Pipes, &c., &c.



WE
only buy the Bricks and Raw Material. So under these conditions we have gained a

REPUTATION

for nothing but the Highest Class of Work, as can be seen in our Illustrations at Smethwick, Leek, Liverpool, Malvern, Shipley, &c., &c.

W. J. JENKINS & CO., Ltd., RETFORD.

EXHAUSTING MACHINERY.

Oldest Makers of High-Class Exhausting Machinery of all Capacities and for all Purposes.

WALLER'S PATENT 3 AND 4 BLADE EXHAUSTERS

Require less Steam and maintain a steadier Gauge than any other type.

OVER 1000 SUPPLIED.

WALLER'S PATENT "COMBINED" EXHAUSTING SETS FOR SMALL WORKS.

With Steam or Gas Engine, and all Accessories self-contained on one base plate. From 500 cubic feet to 10,000 cubic feet per hour.

SPECIALLY DESIGNED EXHAUSTER SETS FOR WATER-GAS PLANTS.

EXHAUSTING MACHINERY FOR BYE-PRODUCT PLANTS.

COKE-BREAKING MACHINERY.

TAR, LIQUOR, AND WATER PUMPS.

GEORGE WALLER & SON,

165, QUEEN VICTORIA STREET, LONDON, E.C.

Works: Phœnix Iron-Works, Stroud, Gloucestershire.

Telegraphic Addresses { London: "Weighbeam, London." / Stroud: "Waller, Brimscombe." }

Telephone Numbers { London: 2420 (P.O.) Central. / Stroud: 210 Brimscombe. }

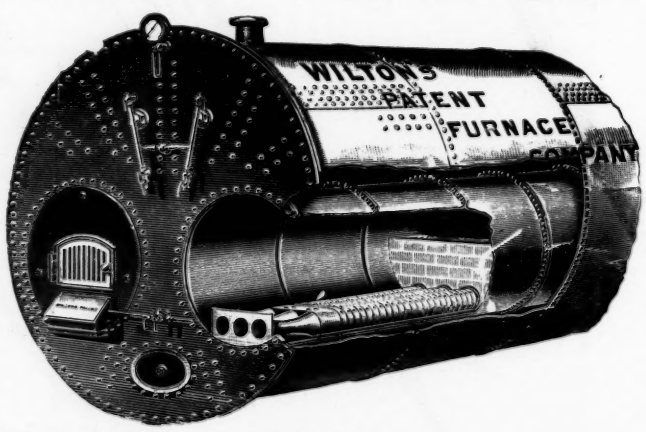
Agents for Scotland: D. M. Nelson & Co., 53, Waterloo Street, Glasgow.

WHEN ORDERING YOUR NEW BOILERS SPECIFY

7000 WILTON'S 7000

IN USE. PATENT FURNACES. **IN USE.**

16 TO 18 per cent. CO_2



16 TO 18 per cent. CO_2

FULL PARTICULARS AND PRICES ON APPLICATION TO

THE CHEMICAL ENGINEERING CO.

AND

WILTON'S PATENT FURNACE CO.,

79, MARK LANE, E.C.

Telephone: No. 2669 AVENUE.

Telegrams: "EVAPORATOR, LONDON."

CROWN WORKS, ABBEY LANE, STRATFORD, E.

CONTENTS.

EDITORIAL NOTES.

GAS, &c.—

Meeting of the South Metropolitan Gas Company 409
The Meeting of the South Suburban Gas Company 410
History Repeats Itself 410
The South Suburban Gas Company and Excess of Sulphur 411
Institution of Gas-Works Contractors and Manufacturers—Cost of Electricity and Gas in the City—The Lighting of Railway Trains by Incandescent Gas—Infatuated Councillors at Wilmslow—The Tests and the Lights—An Echo of the Bethesda Strike—The Deputation Question in Another Form—What Doth it Profit a Man?—Minimum Wages for Unskilled Labourers—The Need of an Engineering Assessor 411

ESSAYS AND REVIEWS.

The Testing of Gas Coals 414
Gas Stock and Share Market 416
Electric Lighting Memoranda 416
Depreciation *v.* Sinking Funds 417
Gas Supply in Times of Trouble 418
Lady Inspectors for Cooking-Stoves. By G. Stevenson 418
Directory of Electric Lighting and Traction . 419
Gas Producers for Power Purposes. 419
In Defence of the "Dowser" 421

TECHNICAL RECORD.

Yorkshire Junior Gas Association—Mr. J. F. Smith on Naphthalene 422
Junior Institution of Engineers. 425
Scottish Junior Gas Association—Western District—
Mr. J. Webster on Coal Conveying and Handling Plant 426
Mr. A. Mackay on Carbonization of Coal . 427
Society of Engineers 428
Bennett's Patent Storm-Proof Lamp . . 428
The Duty of Pumping-Engines 428

REGISTER OF PATENTS.

Regenerating Gas-Burners and Heaters—M'Knight, J. W. 429
Illumination Devices in Connection with Gas-Meters—Melhuish, A. G. 429
Flues for Gas-Stoves—Adams, W. G. 429
Producing Gas for Gas-Engines and Other Purposes—Prentice, J. S. 429
Atmospheric Gas-Burners—Kay, M. 430
Coin-Freed Mechanism for Prepayment Gas-Meters—Fox, T. 430
Gas Producers—Talbot, B., and Mond, L. . 431
Incandescent Gas-Burners—Smith, T. B., and the Sunlight and Safety Lamp Company . 431
Producing High-Pressure Incandescent Gas-Light without Central Compression Plant and Separate High-Pressure Main—Salzenberg, E. 431
Working Combustion Motors in Combination with Gas-Producers—Sonderegger, C. . . 432
Mantle Supports for Incandescent Gas-Burners—Falk, Stadelmann, and Co., and Falk, S. 432
Patent Notices 432

CORRESPONDENCE.

Systems of Testing Illuminating Gas . . . 432
The Profession of Engineering in America; Distillation of Coal by Highly Heated Gas 432

LEGAL INTELLIGENCE.

Greenwich Police Court—Lewisham Borough Council *v.* South Suburban Gas Company; The Question of "Unavoidable Cause" . 433
The Charges against a Gas Company's Secretary 436

MISCELLANEOUS NEWS.

Commercial Gas Company—Half-Yearly Report and Accounts 436
South Metropolitan Gas Company 437
South Suburban Gas Company 441
Bristol Gas Company 443
Provincial Gas Companies 443
Price of Gas at Doncaster—No Reduction . 444
Mr. Henry Austin on Co-Partnership . . . 445
The Manchester Gas Undertaking—Some Big Figures 445

MISCELLANEOUS NEWS (*continued*)—

Reduction for Large Consumers at Lincoln . 445
High-Pressure Lamps in Westminster . . 446
Bursting of the Vyrnwy Water-Main . . . 446
Notes from Scotland 446
Stock and Share List 446
Current Sales of Gas Products 447
Coal Trade Reports 448
Trade Notes 449

PARAGRAPHS.

Underground Sources of Water in Lincolnshire 415
Masonic—Estimation of Carbon Monoxide in Confined Spaces. 417
New Method of Laying Concrete 418
Personal and Obituary 420
Proposed Amendment of the Companies' Acts—Bye-Products Coke-Ovens in America—Stiffening a Large Water-Tank 422
Conveyance of Tar and Liquor by Rail—Apparatus for Thawing Pipes 425
Leakage of Gas into Dwelling-Houses—South Hayling Parish Council and the Gas Company's Order. 432
End of the German Coal Strike—Sheffield Water Supply—Wrexham Town Council and the Gas Company's Bill 440
London Borough Councils and the Gas Bills—Serious Gas Explosions at Railway Stations 443
Water-Works Extensions at New Brighton . 444
General Gas Lighting and Heating Company of France—Gas *v.* Electricity for Street Lighting in Belfast 449
Extensions at Dublin—Carriage of Calcium Carbide on the Thames—Sales of Stocks and Shares—Corporations and Plumbing Work—Birmingham and Compensation Water to the Wye—Carrying Electric Wires Across Roadways Without Permission—Water Supply of Newtownards—Assessment of London Water-Works 450
Power-Gas Plants—Gas-Stoves and Rubber Tubing—Burley-in-Wharfedale and the Otley Gas Question—Reductions in Price—Cost of Electric Street Lighting at Gravesend—The Cost of Fog—Extensions at the Marple Gas-Works 451
Poll on the Otley Gas Purchase Scheme—Outbreak of Typhoid Fever at Lincoln . . 452

Messrs. HUMPHREYS & GLASGOW

AND

THE UNITED GAS IMPROVEMENT CO., U.S.A.

CARBURETTED-WATER-GAS PLANT

— DOUBLE-SUPERHEATER SYSTEM. —

H. & G., LONDON **153,500,000** Cu. Ft. Daily

U. G. I. CO., U.S.A. **434,700,000** Cu. Ft. Daily

TOTAL 588,200,000 Cu. Ft. Daily

Messrs. HUMPHREYS & GLASGOW,
38, Victoria Street, London, S.W.
31, Nassau Street, New York.

THE UNITED GAS IMPROVEMENT COMPANY,
Philadelphia.

Telegrams { "EPISTOLARY, LONDON." "HUMGLAS, NEW YORK."

THOMAS GLOVER & CO.'S PATENT NEW IMPROVED PREPAYMENT METER

For Pennies, Shillings, or any Coin.

Simple in Mechanism.
Positive in Results.
Price Changer *in Situ.*

GUARANTEED FOR FIVE YEARS.

Telegraphic Address: "GOTHIC, LONDON." Telephone No. 6159 Bank.

THOMAS GLOVER & CO., LTD.,

GAS-METER MANUFACTURERS,

LATE OF CLERKENWELL, NOW 49, QUEEN VICTORIA STREET.

Telegraphic Address: "GOTHIC, LONDON." Telephone No. 6159 Bank.

BRISTOL:	BIRMINGHAM:	MANCHESTER:	GLASGOW:	BELFAST:	MELBOURNE:
28, BATH STREET.	57 & 58, BROAD STREET.	132 & 134, CORN EXCHANGE BUILDINGS.	26, WEST NILE STREET.	8, EXCHANGE PLACE, DONEGALL STREET.	23, WRIGHT'S LANE, LONSDALE STREET,
Telegraphic Address: "GOTHIC."	*Telegraphic Address:* "GOTHIC"	*Telegraphic Address:* "GOTHIC."	*Telegraphic Address:* "GASMAIN."	*Telegraphic Address:* "GOTHIC."	
Telephone No. 1005.		Telephone No. 3398.	Telephone No. 6107 Royal.		Telephone No. 3718

PARKINSON'S STATION METERS.

PARKINSON AND W. & B. COWAN, LTD.
(*Parkinson Branch*),
COTTAGE LANE, CITY ROAD, LONDON.
BELL BARN ROAD, BIRMINGHAM.

JOURNAL OF GAS LIGHTING, WATER SUPPLY, &c.

EDITOR & PUBLISHER: WALTER KING. OFFICE: 11, BOLT COURT, FLEET ST., LONDON.

VOL. LXXXIX., No. 2179.—TUESDAY, FEBRUARY 14, 1905.

EDITORIAL NOTES—GAS, &c.

Meeting of the South Metropolitan Gas Company.

THE proceedings at the half-yearly meeting of the South Metropolitan Gas Company last Wednesday were rather more prolonged than usual, owing to the necessity of holding a second meeting for the consideration and approval of the Bills which the Company are promoting in Parliament. The proceedings were very interesting throughout; and the shareholders cordially endorsed the gratification expressed by Mr. Simpson Rostron at Sir George Livesey's happy recovery from a long and serious illness. This is a matter, indeed, for general rejoicing; as also that, in presiding over the meetings, he showed even more than his accustomed force and clearness. It is satisfactory to know that the Directors have no expectation of having to raise the price of gas, notwithstanding the deficiency of profit shown by the half-year's accounts. On the contrary, the possibility of even a lower figure than 2s. per 1000 cubic feet is characteristically kept in view.

The additional business gained by the Company during the half year, to which reference was made in these columns on Jan. 31, should, according to calculation, have increased the consumption of gas by 270 million cubic feet in the half year, equal, it may be observed in passing, to the entire annual consumption of such important places as Harrogate, Exeter, Dover, or Wakefield. As the result, however, an increased consumption of only 170 million cubic feet had been obtained. This showed a loss in other directions of about 100 million cubic feet, which, in the opinion of the Chairman, was mainly attributable to the more general use of incandescent mantles. This is a more than probable explanation, since it is certain that the growth of gas consumption for lighting purposes continues to be greatly checked by the notable economy of this mode of lighting, examples of which were given by the Chairman. Nevertheless it is the best friend of the gas companies, inasmuch as it enables them to compete successfully with the electric and other rival lights. In reply to a shareholder who, comparing the present rate of increase with that of a few years ago, was disposed to think that enough was not being done by the Company to extend their business, some interesting information was given by the Chairman. It appears that the Company have in their service a staff of canvassers who are continually on the look-out for new business, besides which the Company's employees are paid a bonus for each new customer they may procure—one of them having last year added by this means about £80 to his income. Mr. Carpenter, when acknowledging the customary vote of thanks to the staff, returned to this subject; and what he said with regard to it, while very encouraging from the Company's point of view, gives food for serious reflection. The details supplied by Mr. Carpenter will be found in the report of the meeting in another column; but the particular point to which we desire to refer is that it is apparent from what he stated that there is a migration going on from the North to the South of London of users of gas for power purposes, attracted apparently by the comparatively low price of the gas supply. This is a matter to which attention was directed in the course of the inquiry by the Select Committee on Metropolitan Gas Companies in 1899, when Mr. Joseph Trenner pointed out the disadvantage under which a manufacturer on the north side of the Thames laboured in having to pay £100 for the same quantity of gas as cost only £70 on the south side. There is much the same inequality of price now as there was then; and this is having the natural effect of attracting consumers from the north to the south side. In fact, what was in 1899 advanced as a matter of argument in favour of a reduction in price on the north side, appears now to have become a potent factor in deciding the locality of the consumer who, in these days of competition, finds high rating and dear gas more than he can bear.

The very satisfactory announcement was made by the Chairman that the London County Council had expressed willingness to confer with the Companies with a view to arriving at a satisfactory agreement with regard to the Bills now before Parliament; and the Companies, on their side, were quite willing to enter into negotiations. He explained that the Bill promoted by the London County Council and the Joint Bill of the three Metropolitan Gas Companies had much in common; but the latter could not agree to the reduction proposed by the former of 1d. in the standard prices, nor to the proposed tests for calorific value and illuminating power with a flat-flame burner being made at the expense of the Companies. What the Companies want is freedom from restrictions which were imposed forty years ago, in totally different circumstances. Then gas was the only source of light that could be distributed, and oil was not a serious competitor. Now gas is subjected to severe competition from both oil and electricity; and this is the best security for good service the consumers can have—it being a matter of vital importance to the Companies to retain their custom. Sir George gave an illustration of the inutility of hard-and-fast regulations and methods by referring to the relative positions of the flat-flame and argand burner. The latter, he said, was defined for the purpose of gas testing in 1869, and had never since been improved upon; whereas the flat-flame burner had been so much improved during the same period of time that the best type gives almost as much light for the same consumption of gas as the standard argand. True; but may it not be reasonable to infer that had the argand burner been just as convenient for general use as the flat-flame, invention would have been equally stimulated for its improvement? The prescribing of the "London" argand as the burner to be used for testing purposes did not necessarily stereotype the argand for all time, nor has it in reality had that effect, seeing that there have always been better argands available, in the sense of their giving more light than the "London" argand for the same consumption; but the greater convenience of the flat-flame has prevailed over economy of consumption. Referring to the Bill promoted by the Company for the abolition of the Gas Referees, Sir George pointed out that, whereas the Act of Parliament providing for their appointment stipulates that one at least of them shall have a practical knowledge of gas manufacture, this condition, essential for the protection of the Gas Companies, has for many years been ignored, and appointments have been made of men eminent, no doubt, for scientific attainments, but without any experience whatever of gas manufacture, or of the requirements which gas undertakers have to meet. Just imagine, said Sir George, three professors appointed to control shipping operations, knowing nothing of the business. What would such a man as Mr. Imray say to his business being subjected to such control? The parallel, though not complete, is a sufficiently forcible one; and it is greatly to be hoped that Parliament will admit the justice of the contention that the Gas Referees are, and have been for a long time, a hindrance instead of a help to the gas industry and gas consumers. Their action in regard to testing for the presence of sulphuretted hydrogen alone shows how incompetent is a body so constituted to have any control over the operations of an industrial undertaking. Parliament, as Sir George pointed out, prescribed that the gas shall be quite free from sulphuretted hydrogen, and it explained what was meant by this, by defining, in the Gas-Works Clauses Acts, the test to be employed. This is, to expose a paper saturated with acetate of lead to a stream of gas for three minutes—an extremely delicate test, as all chemists are fully aware. If the paper at the end of the exposure shows no discoloration, the absence of

sulphuretted hydrogen is proved. The Gas Referees, however, extended the time of exposure to fifteen hours! The approaching quinquennial re-valuation for rating purposes gave Mr. Bush an opportunity for pointing out that most of the increase in the amount paid for rates during the last five years is due to increased rates, or, in other words, to municipal extravagance.

The Meeting of the South Suburban Company.

It was assumed that some reference would be made at this meeting to the adverse decision of Mr. Baggallay on the previous Tuesday, on which we comment elsewhere; and expectation was not disappointed. The Chairman, Sir George Livesey, explained once more to the shareholders the difficulty under which the Company had been manufacturing gas in compliance with the restrictions as to sulphur compounds in their Acts of 1873 and 1893. The only process by which these compounds could be reduced was that in which lime is used; and the removal of spent lime from the purifiers and from the works was an annoyance to the neighbourhood, and had involved them in criminal proceedings by the Lewisham Borough Council. In this dilemma, and fortified by the finding of the Departmental Committee of the Board of Trade that the non-removal of these sulphur compounds is no disadvantage to the consumer, and their recommendation that the restrictions with regard to them be abolished, the Company decided to cut the knot of their difficulty by abandoning lime purification. Before doing so, however, they took the consumers into their confidence, pointing out that this course would involve leaving in the gas a small additional quantity of sulphur; and in the circular announcing the change, they appealed to the Local Authorities to give it a fair trial. From the consumers little has been heard but satisfaction at the change; while of the six Local Authorities in the Company's district of supply, five have so far been quiescent. The sixth is the Lewisham Borough Council, who appear to glory in being—as described by Sir Fortescue Flannery, adopting our definition of them in the issue of the "Journal" for Jan. 31—a persecuting authority.

What they think is likely to be the permanent gain of such proceedings as those of last Tuesday it is difficult to imagine. They are, in reality, an endeavour to upset the decision of the Board of Trade Committee, although this is much more likely to command respect than that of any police magistrate, however able and impartial. Sir George Livesey, indeed, complained—and with very good reason—of the course which was adopted in these proceedings. At the previous hearing, the case for the prosecution was closed; and after hearing the evidence of Sir George Livesey, the learned Magistrate was of opinion that the case might be adjourned *sine die*. Thereupon an application was made on behalf of the Lewisham Borough Council to be allowed to bring rebutting evidence; and this was acceded to. Thus a fortnight longer was given the prosecution to prepare their case, with the advantage of knowing what was the defence of the Company; while at the adjourned hearing the latter were at a disadvantage in not knowing what additional points might be brought forward. They did, however, the best they could, and complain, not without reason, that the statements of Sir George and Mr. Hunt—two engineers who, as Sir George observed, could together muster nearly 100 years of practical experience in the gas industry—should have had less weight with Mr. Baggallay than the statements of one who has never had any practical experience as an engineer in the manufacture of gas, and whose evidence was wholly derived from a diligent study of the literature of the subject. The fact, however, is that a police court is an eminently unsatisfactory tribunal for dealing with a matter of this kind. A very important step in the direction of substituting for it some other tribunal will have been taken by the adoption, as proposed by the Bills now before Parliament relating to the Metropolitan Gas Supply, of the recommendations of the Board of Trade Committee to transfer to the Chief Gas Examiner the functions exercised by Magistrates in regard to imposing fines for deficiency of illuminating power or purity.

An appeal has been decided on; there being every reason to believe the Company can prove their case. The inequality of treatment of gas undertakings in respect to sulphur compounds was aptly illustrated by Sir Fortescue Flannery's reference to the gas supply of the neighbouring borough of Croydon, part of which is derived from this Company; the main supply by the Croydon Gas Company being free from any restrictions as to these. Thus, in respect of a few streets and roads, the Croydon Corporation are in a position to prosecute this Company for supplying gas of a quality which they are bound to accept without demur in every other part of the borough. With regard to this "excess" of sulphur, Sir George repeated what he had already mentioned at the meeting of the South Metropolitan Company—that chemists stated it in a misleading manner. Grains and cubic feet were not comparable, and to say that there were 30 grains of sulphur in 100 cubic feet might lead to the superficial supposition that there were 30 parts in 100, whereas, calculated on the weight of 100 cubic feet of gas, which was 22,000 grains, the true percentage was one-seventh part of 1 per cent. Sir George very properly laid stress upon the desire of the Company to stand well with the shareholders and consumers; and there is, it may be said, every reason to believe that the course they have taken has the approval of both. He also referred in suitable terms to the continued loyalty and good service of the Company's officers and employees, working under the co-partnership scheme; and he announced that the provision for electing Employee Directors would be put into operation during the present year.

History Repeats Itself.

Municipalities are raising for themselves a host of new enemies. Financiers (and especially bankers) abhor the new methods and flights into trading of our civic governors; ratepayers are feeling acutely the oppression of municipal lavishness, speculation, and love for parade; and so are many commercial enterprises. History has a happy way of repeating itself; and if one only waits patiently while history is in the making, it frequently happens that, sooner or later, parallels are found for most things that have gone before. So in regard to phases of municipal adventure. How people smiled when first gas companies urged that, as large contributors to the public purse, they should be protected when municipalities embarked upon the uncertainties of electricity supply; but how many have since come to the way of thinking of the gas companies, and are agreed that there was "something in it," some good ground for their contentions, after all. How comparable, too, with what has passed in the case of gas companies is the present position of the railway companies entering London, and catering for the needs of Suburbia. No efforts would now be required to enlist the sympathies of those great railway companies for gas companies, nor that of gas companies for the railway companies. In the case of gas companies, it is not so much the injury they may have suffered in respect of their revenue that they complain of municipal competition, as the gross injustice that is done them in being called upon to contribute largely in support of the competitor through an extravagant method of public lighting, and by being compelled to bear a large proportion of any loss that ensues from the trading. It is often sophistically answered, as a salve for wounded feelings, that if profit is made on an electric light installation, then the gas company will share in the enjoyment of that profit in company with the other ratepayers. But it is usually conveniently forgotten that that profit can only be made at the expense of the gas company, by the abstraction of custom, or by the limitation of their opportunities for business.

On the other hand, the railway companies are losing directly and rapidly through the competition of the electrical tramways; and in this competition we have a parallel to the injustice done to gas companies. The subject, from their own point of view, has been much talked of at recent railway companies' meetings, more particularly at those whose suburban stations tap populous districts. The great municipal electrical tramway systems have made such inroads in the receipts of some of these stations, that it is questioned by the Directors whether they can afford much longer to keep certain of them open. The seriousness of the position for the companies is well reflected by the remarks of Lord Claud Hamilton, at the half-yearly meeting of the Great Eastern Railway Company. With regard to suburban traffic, he stated that they had lost 1,631,220 passengers, and had had a decline in the receipts of £14,111. Depression of trade may account in part for this, but only a small part; and there is no doubt that the electric tramways now running in every part of the Company's district, and in some cases alongside their lines, are at the bottom of the trouble. How much like what has been said, time after time, on behalf of gas companies in connection with electricity supply

are a few remarks by Lord Claud in dealing with this subject? He observed:

As sensible men, they could not find fault with the tramways when they were promoted and conducted by public companies; but what they did complain of were municipal tramways supported by the rates to which they were themselves the chief contributors as ratepayers. If such undertakings were run at a loss, they, as the chief ratepayers, had to make good the deficiency; if, on the other hand, a profit resulted, it could only be obtained by abstracting passengers from the company's system. He thought that this was a most inequitable state of things. Whether Parliament would ever feel inclined to take this view he did not know; but he was strongly of opinion that in cases like this there ought to be some arrangement by which a remission in rates could be made to a company who were the chief ratepayers in a district, and, at the same time, had to contribute towards competition against themselves.

By a conversion of terms, these remarks would have been most appropriate at the meetings of a great proportion of gas companies at the present day. The suggestion as to the "remission in rates" will perhaps strike those folk not immediately concerned as being a little grotesque; but no doubt most gas companies would be prepared to accept such a plan on certain conditions, as an alternative to the Northumberland clauses. However, if the present rate in the growth of opposition to municipal trading continues, the governors of our cities and towns will find themselves in the centre of a great cloud of unfriendliness. Shareholders of gas companies and railway companies do not, let it be remembered, constitute an unimportant and uninfluential body.

South Suburban Company and Excess of Sulphur.

THE adjourned hearing last Tuesday of the summons taken out by the Lewisham Borough Council against the South Suburban Gas Company for excess of sulphur, resulted in a fine of £10 being imposed on the Company, with 25 guineas costs. Mr. Templer Down, who again appeared on behalf of the Council, called Mr. W. J. A. Butterfield, the Secretary to the Gas Referees, to give evidence on their behalf. Mr. Butterfield, who was formerly Chemist at the Beckton Gas-Works, is of opinion that the lime process can be worked without inconvenience or annoyance to the neighbourhood of a gas-works. This is in direct opposition to the finding of the Departmental Committee of the Board of Trade, and also to the evidence of Mr. Butterfield's former chief, Mr. G. C. Trewby, as given before that Committee; nor did it withstand the test of cross-examination by Mr. Avory, K.C., who again represented the Company. He admitted, in fact, what everybody knows to be the case, that the lime process, however carefully conducted, does cause annoyance in the neighbourhood of a gas-works, although not always involving Police Court proceedings. Mr. Butterfield proceeded to describe various other processes by which, in his opinion, the sulphur compounds might be eliminated from gas without causing nuisance—one of these being the Cooper liming process, which was much more "alive" nearly a quarter-of-a-century ago than it is now. It is, indeed, an old story; for, as transpired in the course of the proceedings, this mixing of lime with the coal in the retort formed one of the subjects of the very first patent ever taken out in connection with the purification of gas. This was by Edward Heard, in 1806, who, it appears by reference to the patent, claimed to "stratify "lime with the coals in the retort, stove, or other close "vessel in which they are placed for operation." The revival of this method of using lime by Mr. Cooper in 1882 attracted a great deal of attention at the time; and those who are curious as to what was then found to be its value, cannot do better than refer to the exhaustive paper on the subject which was read by Mr. Hack before the meeting of the Midland Gas Managers' Association in May, 1884. This shows it to be an uneconomical process, although, apparently, it did effect some reduction of the sulphur compounds. Mention was also made by Mr. Butterfield of the ammonia process as having been successfully applied at Birmingham many years ago. This interesting experiment, however—for it was only an experiment—was abortive in results; for not only was it not followed up at Birmingham, but an attempt to do so upon a larger scale at the Belfast Corporation Gas-Works resulted in complete failure.

It is difficult to imagine that these references to ancient history could have greatly impressed the learned Magistrate, though he did decide that there were other modes of bringing down the sulphur to 20 or 30 grains on one day than by the use of lime, especially as no attempt was made to show that the Halifax adaptation of the ammonia process has had any result in this direction. What may have had some influence upon his decision was the statement given in evidence that a series of tests had recently been made at the Berlin Gas-Works, on an experimental scale, of a considerable number of English coals, a proportion of which yielded gas which, when purified with oxide of iron, contained less sulphur than the limit prescribed by the Gas Company's Acts. No information, however, as to the availability of these coals was forthcoming, although it was admitted by Mr. Butterfield that their selection would probably increase the cost of gas by 1d. per 1000 cubic feet. This second-hand information seems to have carried more weight with Mr. Baggallay than the statement made by Sir George Livesey on the first hearing, that he knew of no available coal containing less sulphur than Newcastle coal, and that made by Mr. Hunt on this occasion, that he knew of no coal by using which the sulphur compounds could be kept within the limits of the Acts without recourse to lime. The merits or demerits of the sulphur restrictions were not in question, all that had to be determined being whether the Company had exhausted every practicable means in their power to comply with the Acts of Parliament without creating a nuisance to the neighbourhood. The decision was against the Company on this point; the learned Magistrate going so far as to say that there were modes of even using the lime process by which they could avoid the nuisance for which they would be liable to criminal proceedings. This qualification seems to be all-important, since, according to it, "unavoidable cause" cannot be proved, unless it be shown that the Company have rendered themselves liable to criminal proceedings. The plea of unavoidable cause has failed for the time being; but it is probable that the Company will appeal. In any case, it is satisfactory to know that the time is fast approaching when they will be able to lay their case before Parliament. There is every reason to believe that they will then be successful in obtaining a repeal of these sulphur restrictions, as recommended by the Departmental Committee of the Board of Trade in the case of the three London Companies. In that event, what good will have resulted from these proceedings, or what harm from the forbearance of the other Local Authorities in the Company's district of supply?

Institution of Gas-Works Contractors and Manufacturers.

From information obtained from Mr. Charles Clare about the middle of last week, it was satisfactory to learn that he had up to then received about sixty letters from manufacturers and contractors in reference to the invitation to the meeting at the Holborn Restaurant next Thursday afternoon, to discuss the suggestion of establishing an Institution of Gas-Works Contractors and Manufacturers. Of that number, 45 had stated their intention of being present; some half-a-dozen expressed their sympathy with the proposal, and regretted that other engagements prevented attendance; while the remainder assigned no reason for not being able to put in an appearance. This statement is very gratifying; and no doubt, by this time, several others have found they can make it convenient to be present. The favourable replies include contractors, plant makers, meter and stove manufacturers, and manufacturers of lighting appliances, so that all sections will, at any rate, be represented. The great point is that all who attend should be prepared, by a previous consideration of the question, to discuss the matter thoroughly; and we venture to suggest, though we do not presume for a moment to think that they cover all the points, that, if the articles that have appeared on the subject in the "JOURNAL" on and since Dec. 6 are carefully considered point by point, plenty of material will be found to furnish a base for many good speeches and an all-round consideration of the question. The manufacturers and contractors have a common interest, no matter to what section they belong, in doing what they can—by bringing their knowledge, influence, and co-operation to bear from their particular standpoint—to advance the interests of the gas industry. The progress of the industry spells profit to them; and in this there is surely sufficient to supply the cohesion for a useful coalition. We cannot see anything in the gas industry so different from that of the electrical industry (which has two Associations in its manufacturing and

contracting sections) that the former should not also have in the same important sections one Institution, or whatever other name may be chosen. If there is anything different, what is it?

Cost of Electricity and Gas in the City.

In the course of a paper read before the Farringdon Ward Club last Wednesday, by Mr. A. C. Morton, who is Chairman of the Streets Committee of the Corporation, he referred to the lighting of the City streets. He said he was afraid the electric light had been a failure, for during the past few years the side streets had been lighted with incandescent gas in a much more satisfactory manner, and at less expense. The electric lighting of the main streets last year cost the Corporation £13,500; and they were assured by the Gas Company that they could give a better light at about half the cost. Our contemporary the "City Press" asks whether, in making this statement, Mr. Morton was "speaking by the book." We should say he certainly was. The fact that he has been chosen, for the third year in succession, to fill the position of Chairman of the Committee who have control of the streets—a thing which has not occurred for many years—is a sufficient testimony to his great ability to justify the conclusion that he is not likely to talk at random on such a subject as that of lighting. We venture to think he was well within the mark in saying "half the cost." If he had said one-third, we consider he would have been nearer the fact.

The Lighting of Railway Trains by Incandescent Gas.

The article which appeared last week on the subject of the lighting of railway trains by incandescent gas-burners, with special reference to a train which has been experimentally lighted on the London, Brighton, and South Coast line, following on the trial of the lighting of a single coach, will have been sufficient to satisfy readers that, if the further experience accentuates the success already achieved, we have here the commencement of a change of far-reaching importance to both railway companies and the public. A good light that can be depended upon under all conditions is an essential accompaniment to comfortable railway travelling. That is what the public ask for; and what the public want, that they generally get—in time. Furthermore, it is to the interests of the railway companies themselves to be able to supply a good light at a reasonable expense; and from investigation it is found that there is, in addition to the increased illumination, a considerable saving to be effected by incandescent gas-burners as compared with the electric lighting of trains. An opportunity came last week of making a thorough inspection of the train referred to; and every mantle was found intact, and every carriage brilliantly lighted, so much so that many of the passengers were showing some amount of curiosity over the lights. As the train stood at the platforms in London Bridge, with other trains lighted by electricity, the illumination of the latter looked pallid in contrast. From inquiries made, it was gathered that up to that time there had been no destruction of mantles from ordinary vibration. A few of the mantles had on two occasions met with a violent end—once through rough shunting, and, on the other occasion, through the careless lighting of the mantles with a torch. But said the informant—who was a railway man, and had manifestly taken great interest in the lighting—the thing is new to the men; and they have only to get used to it. But even if a new mantle has to be put into each carriage once a week, he added, the expense would be insignificant in the total cost and worry which the electric lighting of the trains occasions. The fitting up of the trains with the latter system, the running costs, and the frequency with which the accumulators have to be charged (especially in foggy weather), make the electric system expensive and troublesome, besides which the variable lighting even on a single journey is the cause of much complaint. On the other hand, the Pintsch Company's system of lighting can be installed at considerably less cost; and the cylinders will carry sufficient gas to last in foggy weather quite three or four days in the ordinary running without attention. The advantage of this, said this informing official, only those can appreciate who are responsible for railway traffic at such times; whereas the requirements for electric lighting do anything but assist in minimizing the dislocation of traffic, just when that assistance would be most appreciated. The Pintsch cylinders give a good reserve. They are usually arranged to contain sufficient gas for 24 to 30 hours' burning; and therefore allowing for five hours' full burning each day, an ordinary coach, fitted with incandescent lamps, will carry gas sufficient for (say) from eight to ten days, or probably rather longer.

Infatuated Councillors at Wilmslow.

The councillors of Wilmslow have been suffering, as many councillors have suffered before them, from electric mania; and in due season, when experience has done its work, there will be a reaction. When a thing is wanted, fatuous obstinacy often blinds the eyes to the illustrations to be picked up, by easy means, from the experiences of others. Here we have a case in point. The Wilmslow councillors have taken their leap in the matter of street lighting by electricity; and reading the reports in the newspapers, we have no hesitation in saying that they violated, nay completely ignored, the maxim which the teachers of their youth endeavoured to implant in their minds, which enjoins one and all to "Look before you leap." What they have done is really a matter of comparatively small concern outside Wilmslow, but, like a bye-election in the political world, their decision has been published widely by those interested—the tests made by the councillors having, says one publication, "beat gas at every point." Therefore it may be useful to others to call attention to the matter, so that they may have the facts ready if required. In the first place, the position in the matter of the Gas Company may be stated, in order to show that they and their Manager (Mr. W. Severs) were prepared to go as far as they could reasonably be expected to do in improving the lighting of the district; and this will make clear that—no matter what the Gas Company offered—the councillors had settled in their own minds that for them there was really no alternative to the electric light. The gas lighting contract is expiring; and the councillors determined they must have an improvement in the bye-roads and streets. For eight years the Gas Company have lighted the main road from the railway station with Welsbach lamps of 85-candle power, at the same rates as ordinary flat-flame lighting. The Company provide everything—pillar and lantern all complete, gas, lighting, extinguishing, cleaning, and painting from Aug. 18 to May 14, for 32s. 4d. per lamp, including the upkeep of mantles. For the further improvement, the Company offered Welsbach "Shadowless" lanterns, on the same conditions, at 37s. per lamp; Sugg's 120-candle power wind-proof lamps, and lighting complete, at 35s.; or the present lanterns with "C" bulb burners at 33s.; and, as a further alternative, the sale of the present lamps as they stand at 30s., and to supply gas at 5d. per 1000 cubic feet less than to ordinary consumers—that is to say, at 2s. 7d. per 1000 cubic feet. All these offers were refused; and now for the issue.

The Tests and the Lights.

The Electric Light Company were asked to put up four trial lights; and one Sunday evening recently, a small party of the councillors might have been seen in Wilmslow testing their eyesight, or as they thought testing the electric lamps, in comparison with the incandescent gas-lights and the flat-flame burners. The crude method they adopted was to test their vision by reading circulars at the farthest possible distance from the lamps. We are not surprised to learn that the flat-flame gas-burners were put completely out of court in the comparison with so-called 40-candle power Nernst lamps. No one, we hope, other than the Wilmslow councillors and electricians would think of comparing flat-flames with any modern methods of lighting. Not less surprising, too, in view of their predilection, is the fact that these observers found in favour of the (reputed) 70-candle power Nernst electric lamps, in comparison with the 85-candle power incandescent gas-lamps. So it has come to pass that on the unaided determination of the councillors, who know as much about Nernst lamps as the Man in the Moon, they have committed the people of Wilmslow to the unreliability of this form of light, and so save (for the time being) a total of £29 13s. in a season by the transaction. The councillors of Wilmslow have to learn what other people have learnt before them, that these lamps are of delicate structure, and that they resent terribly any fluctuations in the pressure of the current. As one councillor, with more caution than the majority of his fellows, puts it, they have adopted "a certainty for an uncertainty." We have no hesitation in predicting that time will confirm the truth of his statement. If the

councillors are wise, they will pay the Gas Company something to keep their gas-lamps standing for the next season in order to meet emergencies, or to assist the Nernst lamps when their innate weaknesses re-volt against a vacillating voltage.

An Echo of the Bethesda Strike.

It may be pretty confidently asserted that not for a long time to come will the late momentous labour struggle at the Bethesda slate quarries of Lord Penrhyn be forgotten by the workmen who with such unfortunate results to themselves took part in that ill-starred strike; for even yet the trouble it brought in its train is far from being at an end in the case of some of those concerned. Some few weeks ago reference was made in the "JOURNAL" to an announcement issued by the Bethesda Pensions Committee, to the effect that a fund was being raised for those of the old quarrymen who, at the conclusion of the strike, were not allowed to resume work on Lord Penrhyn's property; and now there is a well-advertised project on foot to give the men who are able to work employment at a developed quarry which "has been found" near Llanberis. A Society to purchase and work this quarry has been formed; and if all those who were in any way responsible for bringing the men to their present unhappy condition will lend financial support to the scheme, there ought to be no difficulty about raising the necessary capital. That they will do so, however, we do not feel any too sanguine. It is, indeed, to be noted that the project is commended by the Secretary to "all practical friends of the workman, and to all workmen who desire to help their class;" and the former are, one may be pardoned for thinking, not those who encouraged the men to quarrel with a master for whom many of them had worked "for twenty and thirty years," and "whose fathers and grandfathers before them spent their lives and energy cutting out the great quarry." Apart altogether from the question of whether the new undertaking is a sound commercial proposition, the effort to find work for these men is one that must command sympathy. Lord Penrhyn has an undeniable right to employ whom he pleases; but the workmen who have now, more than a year after the collapse of the strike, been refused employment at the Bethesda quarries, have been terribly—and more than sufficiently—punished for their folly. The misery they have brought upon themselves and upon the helpless women and children should serve as a warning to others who may be inclined to indulge in the unprofitable tactics of which they were guilty; and there is little doubt that it will do so until the time when the great Bethesda strike is forgotten by all except the actual sufferers. The letters to the Press of the Secretary of the "Co-Operative Quarries, Limited," are to be welcomed, not only as an attempt to aid the misguided strikers, but also because of the assistance they will render in keeping this warning in the minds of working men generally.

The Deputation Question in Another Form.

We have had occasion to criticize lately the conduct of certain members of two Town Councils in raising objections to the expense incurred in sending deputations to the recent Earl's Court Gas Exhibition; and in regard to one of those cases we ventured the remark that if "the Corporation cannot afford to grant reasonable facilities to those responsible for the carrying on of the gas undertaking to obtain valuable knowledge, the only conclusion that can be come to is that it is a pity the works belong to the town instead of to an enterprising company." These words were, of course, penned in the firm belief that no shareholder in a statutory company paying maximum dividends would dream of asking questions about such an item in the accounts. In this, however, we were unfortunately mistaken, as was proved in the course of the meeting of a Provincial undertaking last week. The Chairman of the City of Durham Gas Company (Mr. John Coward), in the course of his address, alluded to the fact that some of the Directors, together with the Secretary and the Manager, had been to the exhibition, and learnt a great deal, which they intended, as far as possible, to put into practice. He added that the visit was quite an education to the Board, and that such a display had never been seen before. But in spite of this explanation, one of the shareholders rose with the too familiar queries as to how many went on the deputation, and what was the cost; and on being assured that only expenses incurred were charged, he responded with the usual remark about the visit being "a nice little holiday." The amount involved was not, and could not have been, more than a few pounds; but whatever it was, or might have been, the insinuation of the shareholder that the Directors had gone pleasure-making at the expense of the Company was quite uncalled for. Indeed, such a remark was as disparaging to the Board as it was to his own intelligence. Happily Gas Committees and Directors generally showed greater wisdom than a few councillors and at least one shareholder would presumably have done under the same circumstances; and so full advantage was taken of the unique show at Earl's Court to derive knowledge that could not fail to be of use to the undertakings committed to their charge. The beneficial effects of the exhibition will survive long after this narrow-minded quibbling has been forgotten; and the "nice little holidays" spent by gas men in London will bear fruit altogether out of proportion to the trivial expenses involved. The full results of the big display have not, of course, been experienced so far; but that will come all in good time. Meanwhile, let there be an end to ungenerous allusions on the part of the small minority who, in this matter, appear to be unable to see an inch before their noses.

What Doth it Profit a Man?

In the course of a discussion by the Doncaster Town Council upon a proposal of the Gas Committee to reduce the price of gas, one member introduced the following conundrum: "What doth it profit a man if he gain 2d. per 1000 cubic feet on gas and lose 3d. in the rates?" He did not furnish the answer; but presumably it would, from his point of view, be: "Nothing at all." This is, however, only one way of looking at a very old problem. Doncaster (like many other places) is the possessor of a very profitable gas undertaking; but (also like many other places) it is burdened with an unprofitable tramway system. In addition to this, the town has been put to great expense in the matter of water supply. The question therefore was, Should the gas consumers be asked to pay a large portion of the losses of the other undertakings named? It was admitted that, even at the price to which it was proposed by the Committee to reduce the gas, the works would have returned a substantial profit, without at all reckoning the new business that would have undoubtedly accrued from the lower charge. But the Council, after discussing the matter up and down on two or three different occasions, have finally decided, on the casting vote of the Mayor, that the price should remain as at present. We regret this decision, for it has always been our contention that with regard to the "reproductive undertakings" of municipalities "every tub should stand on its own bottom." In the present case, the policy is an unfair one to the gas-works, the Committee, and the Engineer (Mr. Robert Watson), for the retention of a higher charge than the gas could well be sold at must almost certainly tend to restrict the growth of the business.

Minimum Wages for Unskilled Labourers.

There has been a lively debate extending over two meetings of the Liverpool City Council on the question of workmen's wages, with the result that a resolution has been passed to the effect that all able-bodied men employed by the Corporation shall receive wages of not less than 4s. per day—preference of employment to be given to those who have been resident in Liverpool for a period of twelve months. The change will, it is estimated, result in an increase of £18,000 a year in the expenditure of the Corporation; but if this were the only consideration, few people probably would object to what has been done. There are, however, various other matters to be taken into account, which lead one to the conclusion that the innovation may possibly prove to be a not altogether unmixed blessing to the men themselves—or at any rate to all but the most able of them, for a levelling-up of wages is often a danger to the less efficient. A proposal that the 4s. a day should only apply to men between the ages of 21 and 50 was overwhelmingly defeated; and in view of this it is difficult to resist the feeling that the chances of employment for the older men may be prejudiced. Indeed, the Chairman of the Health Committee foreshadowed as much, when he said he was sure the City Engineer would not dismiss any of the old men; but there was no reason why he should not take the best men for the money, and he was afraid a great many of the old men would be left on one side. Then, again, it is stated that

the current rate of wages in Liverpool for the class of labour referred to is from 18s. to 21s. a week; all unskilled Corporation workmen under the existing system receiving not less than the latter figure. This has led to the fear being expressed that the higher rate now to be paid will result in an influx into the city which will add materially to the difficulties of the unemployed problem there. This may be an exaggerated view of the matter; but at the same time it must not be forgotten that a Special Committee of the Council declined to recommend any alteration in the then existing system of employing labour, and in the rate of wages paid.

The Need of an Engineering Assessor.

The advisability of affording assistance to a Judge of the High Court when engaged in trying engineering and technical cases has again been brought forward by Mr. M. Powis Bale, in a letter to a recent number of "Engineering." This is a matter which Mr. Bale has had on his mind for a long time; and a few years ago he addressed our contemporary upon the subject. But however his suggestion may have been received at the time, it has not been acted upon. Mr. Bale has been prompted to revive interest in the question by the fact that Mr. Justice Ridley recently absolutely declined to try a technical action without the assistance of an assessor. He mentions cases within his recollection which became "almost farcical," owing to both Judge and Counsel being unable to properly understand the intricate points raised; and in one case the Judge confessed his inability to deal with it by finally referring the matter in dispute to arbitration, at enormous cost to the parties. In another case, which occupied the Court several days, the loser was so confident that his failure was due to want of thorough comprehension of the points at issue, that he decided on seeking the aid of the Court of Appeal, where, unaided by Counsel, he was successful in upsetting the judgment of the Court below, in a great measure on purely engineering points. Of course, if litigants could always secure the assistance of certain leaders of the Bar who are recognized as, so to speak, "specialists" in technical matters, and if occupants of the Bench possessed the exceptional scientific attainments of the late Mr. Justice Grove, their differences might possibly be more satisfactorily settled. But this is almost too much for anyone to look for. Counsel cannot be expected to understand every subject entrusted to them. They speak to their briefs, supplemented by information on special points obtained at consultations. As the Judge is thus hammered at from both sides, it does seem that he ought to have someone at his elbow to whom to apply for help in appraising the value of the claims of the respective parties. The need for such help is already recognized in the case of the Admiralty Court; and Mr. Bale urges that it is not too much to ask for the appointment of a technical assessor for engineering matters coming before the other Courts. He does not limit himself to this, however, but asks whether it would be outside the province of the various engineering institutions to approach the authorities thereon. He is of opinion that if a reform could be effected, it would considerably simplify matters, and be of much benefit to engineers generally. On this question, as on every other, there is something to be said on both sides; and therefore it is to be hoped that Mr. Bale's letter will not be overlooked by those who are specially interested in its subject-matter. The right and speedy administration of justice is something in which all classes of technicians are concerned.

The Directors of the Sheffield United Gaslight Company yesterday decided to reduce the price of gas by 2d. per 1000 cubic feet. The new prices, depending on the quantity consumed, will vary from 18d. to 14d.

The President of the Board of Education has appointed Professor Henry Adams, M.Inst.C.E., &c., late of the City of London College, to be a member of the Board of Examiners at South Kensington in the "Engineering" group of subjects.

We have received from Messrs. Whittaker and Co. a useful little book on "Gas and Petroleum Engines." The text is a translation and adaptation of a work of M. Henri de Graffigny by Mr. A. G. Elliott, B.Sc. It is the second edition of a book published about seven years ago, and the matter has been brought up to date. The contents consist of a history of the gas-engine, an explanation of its working principles, descriptions of the different kinds of engines and gas-generating plant, and some hints on maintenance. The matter occupies 148 pages, and there are 53 illustrations.

THE TESTING OF GAS COALS.

Who originated the English method of testing gas coals, is an inquiry that may perhaps engage the attention of some future Dryasdust. Not that there was anything particularly brilliant in the idea; for it must have occurred naturally to the practical English mind that the best and, in fact, the only way (short of a trial on a working scale) to prove the value of a coal for gas producing purposes is to subject it to distillation in a miniature gas-works. What might, however, have happened, or after what elaborate preliminary investigation the system would have been evolved, had chemists ruled in the earlier days of gas lighting, can only be inferred from the paper which was read before the meeting at Hanover last July of the German Association of Gas and Water Engineers, by Professor Drehschmidt, the Chemist to the Municipal Gas-Works of Berlin, and reported in the "Journal" for Aug. 16.

This is not said to detract in the slightest degree from Professor Drehschmidt—who is deservedly held in the highest esteem by his colleagues—or his work, which speaks for itself; but the paper serves to illustrate the different ways by which an engineer and a chemist may arrive at practically the same goal. It is a description of an experimental gas-works which has recently been installed at Berlin, and of a number of tests made with it. It commences with an account of the steps that had previously been taken to arrive at the value of gas coals by some method other than the use of a gas-making plant, and more in consonance with pure science. "Endeavours," it says, had "repeatedly been made to take the chemical composition of coal as a basis for their classification."

At first it was supposed that the so-called available hydrogen in the coal—namely, that which remained when the quantity required to form water with the oxygen of the coal is deducted from the total amount of hydrogen present—was the most significant factor. It is found, however, that the total proportion of hydrogen in coal fluctuates within quite narrow limits; while there are much greater differences in the proportion of oxygen present. Thus with 68 varieties of coal examined at the Berlin Gas-Works, the difference in the hydrogen found was at most about 1½ per cent.; while in the oxygen there was a difference of 10 per cent.

A more hopeful basis for determining the value of gas coal was the oxygen present; and the paper quotes M. St. Claire Déville as having arranged coals into five classes, according to the amount of oxygen they contain; it being found that, on carbonization, as the proportion of oxygen in the coal increased, the yield of coke fell, and the total make of volatile products—viz., gas, tar, and ammoniacal liquor—increased, though the volume of gas became smaller. This rule is not, however, without its exception; and, as observed by the author of the paper, it leaves the gas manager in the lurch in regard to the matters which most concern him—namely, the yield and quality of the gas. Interesting, therefore, though such investigations undoubtedly are, they can hardly be expected to appeal very strongly to the practical gas maker.

A proposal to carbonize a small sample of the coal in a platinum crucible is also dismissed by the author as being of doubtful value; and he thus arrives at the conclusion long ago reached in this country and elsewhere, that the gas-making qualities of a coal can only be determined from practical carbonization. Whether, however, this should be conducted on what may be termed a laboratory scale as often practised in this country, where experimental plants for carbonizing the $\frac{1}{1000}$th part of a ton are not uncommon, or on a scale more nearly approaching that of a full-sized gas plant, had next to be determined. The Professor is of opinion that the results to be obtained by means of a miniature gas plant—carbonizing, say, from 1 to 2½ lbs. of coal per charge—are not reliable, for the reason, apparently, that variations of the temperature materially affect results. This, however, applies to any retort, whether large or small, and, therefore, can hardly be regarded as of itself conclusive against the adoption of a very small retort.

In support of his view, Professor Drehschmidt quotes an example of variation which relates to charges on a working scale, of 309 lbs. and 331 lbs., carbonized at different temperatures and worked off in five hours and six hours respectively. Experience thus gained may be, and no doubt is, applicable to much smaller retorts, but, standing alone, can be no reason for rejecting their use. In point of fact, a very small retort is a most serviceable instrument, because, when gas fired from any ordinary gas supply, its temperature can be regulated to almost anything that may be desired. At the same time it is true that the smaller the scale upon which an experiment is conducted, the less chance there is of obtaining accurate results as regards yield of tar and ammoniacal liquor, if for no other reason than that any trifling error in the estimation of these becomes greatly magnified when brought to the standard of per ton of coal. This, however, is of less importance since the yield of such bye-products must always be to a great extent subservient to that of gas.

Of greater moment is the determination of the quantity and quality of the coke produced, because upon these depend the efficient and economical heating of the retorts, and, to a great extent, the disposal of the surplus. A very small charge of coal is of little service for ascertaining the size, density, and general appearance of the coke yielded by any particular coal. For this

information reference is necessary to a charge weighing not less than ½ cwt., and even then the results can only be regarded as comparative. Chemical analyses are, of course, required to determine the amount of ash and purity as regards presence of sulphur —matters which are generally considered as being beyond the control of the gas maker, and to which, therefore, not much attention is usually given. The gas maker, however, who fixes his eye solely on the yield of gas, places himself at a disadvantage. Gas must be his first consideration; but the other items of profit and loss account have also claims on his attention.

In the economy of gas manufacture the receipts for coke have a prominent place, and the more that is known of the good and also of the bad points of this residual, the better it must be. It may not always be possible to eradicate the latter by changing the coal; but, at all events, a knowledge of them may help in the selection of suitable markets. In this connection the communication by Herr Stack, of Hanover—which was read at the same meeting—entitled "The Use of Gas Coke"—should prove of service. Although not directly applicable to the conditions which prevail in this country, it points to the possibility of finding additional uses for gas coke, if they are diligently sought for.

The author of the paper supports his preference for an experimental apparatus approaching in size that of an ordinary gas plant, by pointing out that when the conditions of carbonization are altered, the whole of the volatile products are affected in regard to their quantity, nature, and action one upon another. Granted that this is so, the question then arises, is the full-sized gas plant the most suitable for obtaining the best all-round carbonizing results. Some will answer this in one way and some in another; for there is considerable diversity of opinion with regard to the very foundation of the position taken up by Professor Drehschmidt. The veteran gas maker, Mr. George Anderson, many years ago pinned his faith to small retorts, and, so far as is known, has never had any reason to regret having done so; while the recent installation of 12-inch diameter retorts at East Greenwich will occur to every one.

It may therefore be regarded as undesirable to produce, in the shape of experimental gas plant, an imitation of retort-house practice. What should be aimed at rather is an apparatus by means of which the full gas producing value of a coal can be ascertained, no matter how much this may be in excess of the value obtained in the retort-house. From such an apparatus it should be possible to learn, not only the *comparative* value of all coals submitted for test, but also something of the conditions under which the best carbonizing results are to be obtained; and this, with intelligent observation, should prove to be not the least valuable of its uses. Even in this respect, however, an experimental gas-works has its limitations, and must not be too greatly relied on.

It is worth noting by those who in this country lay stress upon the desirability of having their experimental plant upon what they call a working scale, and expend—not to say waste—much money on this object, that Professor Drehschmidt, though impressed with the desirability of approximating the dimensions of a full-sized gas plant, realizes to the full the objection to employing a setting having a number of retorts. "With such a setting," he says, "and still more with several settings, it becomes difficult to maintain the retorts at a uniform heat, or to alter the heat according to the nature of the coal under examination. Moreover, a large quantity of coal would be required for testing, and the whole of the retorts cannot be charged simultaneously; so that it becomes impossible to follow precisely the course of carbonization hour by hour." These practical observations of a member of a profession not generally credited with practical vision, are a rebuke to those who think it a very excellent thing to reproduce in their experimental plant—regardless it may be of expense—the imperfections of the retort-house.

The experimental plant at Berlin, then, was made to consist of a single setting of only two retorts, 9 ft. 2 in. long by 20½ in. by 15½ in., with semi-producer firing. It may be suggested that even this small number is one too many. It was, however, believed that the favourable results which such a setting should afford—these being independent of all the irregularities of full-scale working—would serve as an ideal to be aimed at on the works, and indicate changes and improvements for adoption in the latter. With the aim which is thus indicated, we are entirely agreed. It is claimed that these expectations were well founded, since in 1902, the yield of gas per ton of coal carbonized at the Berlin works rose to 11,490 cubic feet from 10,952 cubic feet in 1901, when no experimental plant was used for studying the coals.

It can hardly be necessary to follow the Professor through his description of the plant beyond the retort-setting, since in only one respect can any variation of this materially affect results. The efficiency of the purification and the elimination of bye-products may be taken for granted. The only exception that may be made is in regard to condensation. It is clearly undesirable to lay down any hard-and-fast rule as to the kind of condenser to be used, or the extent to which contact between gas and tar should be promoted. These are matters that may very well form the subject of experiment having regard to the unsettlement of opinion respecting them.

There is, however, one matter to which attention should be directed, because it is of particular importance, especially if horizontal condensers be employed—viz., the temperature down to which the gas is cooled. This should be kept to one thing, as far as practicable, because otherwise the results obtained will not be comparable. The same coal will produce quite different results with a variation of 10° or 20° in the temperature down to which it is condensed. Uniformity in this respect can generally be obtained by the use of a water condenser.

To return to carbonization. The mode of working in regard to this is described in the paper as follows: The setting was heated to a high or low temperature, according to the origin of the coal to be examined, and the two retorts were then charged simultaneously—the charges, amounting to 309 lbs. or 331 lbs. per retort, had been previously weighed in the charging scoops. As fresh coals are more or less damp, and it was important to be independent of irregularities, in order to obtain strictly comparable results, the coal had previously been spread out in thin layers in a covered space, until the proportion of moisture had fallen to 2 per cent. on the average

Observation of the rate of gas production each hour, and especially in the last hour, and of the phenomena when the retort was opened, showed whether the charge had been completely worked off in a given time. If it was not completely worked off (as was usually the case at the first trial), then alterations were made, according to circumstances, either in the heat, the weight of the charge, or the time for working off, until the most favourable carbonizing result had been secured.

It is further mentioned that these three chief factors in determining results had frequently to be altered—more especially with English coals—owing to trouble with thick tar; and that, when the most suitable conditions had been ascertained, carbonization was followed under them for at least three or four days, and the mean result for these days was recorded. Hourly readings were taken of the pyrometer, the thermometer, the water meter, the pressure gauge, and the gas-meter.

There can be no doubt of the painstaking character of the testing according to this method; but since each test is made to occupy at least three or four days, it is evident that not more than 60 to 70 tests can be made with a single plant in a year. How would this suit the English gas maker, who is called upon to test, and does actually test in the course of only a few weeks, perhaps from 50 to 100 samples? Is the method which he employs—of necessity a far more rapid one than that which is under consideration—less reliable than the latter? With all respect to Professor Drehschmidt, we think not.

A single small retort will save both time and money; for the rest of the plant need only be proportioned to it, and, instead of one test occupying at least three or four days, it need not take more than as many hours, even if ½ cwt. charges are employed. With this weight of charge, the time required for burning-off will vary considerably with the quality of the coal, although the temperature of the retort may remain fairly constant. The time-limit is in fact of itself an excellent test of the suitability of a coal, having regard to the conditions of practical carbonization, for it indicates, in connection with the latter, the variation of temperature that may be required to yield the best results. A good plan to follow is to keep the charge in until the yield of gas slows-down to a given rate per unit of time. Then time the duration of the charge, alter the temperature accordingly, and repeat the charge. With a small retort, too, the gasholder may be sufficiently large to take the whole of the gas yielded by one charge of coal, and thus avoid the necessity for any proportionating arrangement.

The paper concludes with some very interesting comparisons between samples of English, Westphalian and Silesian coals tested by the Professor. From these it appears that the amount of ash is highest as a rule with Westphalian and English coals, reaching sometimes as much as 20 per cent. The English coals could only be carbonized at tolerably low temperatures if severe tar stoppages were to be avoided. Silesian coal gave the least difficulty in carbonization. The use of the latter may to some extent account for the higher carbonizing temperature employed on the Continent than in this country. At the same time, English coals hold their own there for gas-producing value; as evidenced by the favour in which they continue to be held. It is, however, mentioned that these coals yield more volatile sulphur than Westphalian and Silesian; the amount of sulphur in the purified gas being the highest with English coals.

This is a point deserving the attention of English gas makers who desire to see their cost for purification kept down. There are plenty of gas coals to choose from, and would be more if the means of transport did not restrict the fields from which supplies can be drawn; and the selection should in all cases be made according to value as ascertained by careful analyses, covering all essential points.

Underground Sources of Water in Lincolnshire.—The Board of Agriculture and Fisheries have sent a copy of a memoir of the Geological Survey just published, on the "Water Supply of Lincolnshire from Underground Sources, with Records of Sinkings and Borings." It is a continuation of the series of county memoirs on water supply of which those relating to Sussex and Berkshire have already appeared. Records of all known borings and sinkings in Lincolnshire are given, together with numerous analyses of water. In the introduction there is a general account of the geological formations, with special reference to the water-bearing strata; and there is a special article on rainfall, accompanied by a map, by Dr. H. R. Mill.

THE GAS STOCK AND SHARE MARKET.

(For Stock and Share List, see p. 446.)

THE Stock Exchange had a much more cheerful week in that which has just closed. Business might perhaps have been a little more plentiful, especially in the earlier days; but the tendency was uniformly good, and steadily improving. The chief factors making for the advance were an abiding faith that the present internal troubles in Russia are making nevertheless for peace at some more or less proximate time, and a firm forecast that money is going to be cheap soon and to keep so awhile. Foremost to gain by these exhilarating considerations was the gilt-edged division, which had a nice advance—lasting the week well out, despite the usual realizations of Friday. There was a good demand in the Money Market, for which the Stock Exchange settlement was largely responsible; and discount rates stiffened. In the Gas Market, the most noteworthy feature was the recovery in Gaslight and Coke, which had been depressed owing to the disappointed expectation of the market that the Company would declare a rate of dividend which was, in point of fact, higher than the law authorized. Dealings in the ordinary stock were very brisk indeed, and constituted by far the larger part of the week's operations. At the opening, the tendency was rather shy, and 99¼ was marked on Monday. But these figures were soon left behind; and by Saturday 100¾ *ex div.* had been attained. Small business was done in the secured issues at good firm prices; the maximum marking 95, and the preference from 111 *cum div.* to the same figure *ex div.* (although the quotation was not advanced). The debenture commanded 88½. South Metropolitan was not active. The opening price was 132 *cum div.*, and the closing price 128½ *ex div.* The debenture marked 88⅜. In Commercials, there was hardly anything doing. The 3½ per cent. was done once at 114, and the debenture once at 87¾. The Company will pay the same rates of dividend as last half year. In the Suburban and Provincial group, business was rather quieter than usual; but where anything was done, prices were good. Alliance and Dublin old marked 22 and 22½, Brighton original 232, British 41⅝, and Bromley "B" 94. North Middlesex original changed hands at 20½, and Tottenham and Edmonton debenture at 102½. West Ham debenture was not dealt in; but the quotation jumped up four points. Derby is paying a higher dividend, and so is Newcastle; but the latter's quotation had a slight set-back, which it can well bear. The Continental Companies were very quiet. Imperial marked a few transactions between 210 and 212, Union marked one at 118¼, and European was not dealt in. Among the remoter undertakings, Cape Town preference was done at 10, Melbourne 5 per cent. bonds at 104½, and ditto 4½ per cent. at 102¾. Monte Video marked 11⅛ and 11¼, River Plate from 12 5/16 to 12½, Primitiva 5⅝ and 5 31/32, ditto preference 4⅞ and 4 29/32, ditto debenture 95, and San Paulo debentures 52½. Bombay was done at 6⅜ and 6 7/16.

The closing quotations are shown, as usual, in our Stock and Share list on p. 446.

ELECTRIC LIGHTING MEMORANDA.

A Professional Teacher of Truth—The Defects of Present-Day Electric Lamps—Dim Prospects—The Prevention of Electrical Fires.—Good Counsel for Dublin—Water "Power" at Worcester.

THE members of the Junior Institution of Engineers who were privileged to hear the paper, on "Recent Developments in Electric Lighting," by Professor H. T. Davidge, at their first meeting this month, must have left duly impressed with the immensity of the difficulties opposing the electrician in the production of more economical lamps. In lamps which shall produce a greater quantity of light with the expenditure of the same or less electrical energy—in order that present generating plant and fuel consumption may be equal to a large increase in the number of lamps supplied—are found the needs of the electrical industry. The author on this occasion is the Professor of Electrical Engineering at the Ordnance College, Woolwich; and therefore he may be credited with knowing full well what he is talking about on this special subject. He is a man of settled convictions, and, it may be said, has no objection to stating what those convictions are. He recognizes things as they really exist, and as far as he is able judges the future by the signs of contemporary progress. Looking all round, he determinately says that it is *not* easy to see that the electrical engineer can expect, on the face of things, to obtain the cheapest form of light, since he takes the energy employed in its production through the roundabout paths of coal, steam, engine, dynamo, and lamp; whereas the gas engineer has the shorter path—coal, gas, and lamp—to consider. This is not a statement that one expects to fall from the lips of a Professor of Electrical Engineering; but it is his deliberate opinion. This being the position of affairs, in what direction may the electrician hope for success? "It appears probable that it is only the numerous advantages of the electric light to which it is difficult to fix a pecuniary value, which may ensure its superiority in the long run." "Numerous" is an adjective that must have been either flippantly used, or employed to mollify the dissatisfaction which his outspoken opinions are bound to provoke. Whether the advantages are numerous or not, certain it is that they are too intangible to countervail costliness. Hope for better things is freely expressed in the paper; but the foundation for that hope is not deeply laid.

We should like, but the exigent claims of other matter this week forbids, to take copiously from this extensive paper, to show readers the position and possibilities of the various types of electric lamps as competitors. A glance, however, may be made at parts. In the first place, the term "efficiency" as applied to electric lamps is one that is enveloped in some dubiety. Obviously, as Professor Davidge says, an exact means of judging the character of a lamp is to consider the ratio of the energy given off as useful light to the whole energy consumed; and this indeed forms the scientific definition of the "efficiency" of a lamp. But the commercial definition is the ratio of the watts consumed to the candle power given out, and hence the efficiency of any lamp is stated as so many watts per candle. And thus, it follows, the worse the lamp, the higher the number expressing the efficiency. The question is complicated by the fact that the different lights vary in colour; that the light emission is not the same in all directions, and needs to be properly averaged; and that the light proceeding from a point has a "use-value" different from that due to light proceeding from an area. The two chief difficulties are met in practice by neglecting differences in colour; and, secondly, by defining the candle power of an incandescent lamp as the horizontal candle power, and that of an arc lamp as the mean spherical candle power. These are matters on which it is valuable for the gas engineer to be primed when he is called upon to speak of the lighting values of electric lamps. Professor Davidge also makes several interesting pronouncements on the constitution and performance of electric lamps. For example, in the arc lamp, he informed his audience much energy is dissipated, and only a small portion is given off as light. In the Westinghouse Bremmer lamp, great difficulty has been found in dealing with the deposit of fine dust over parts of the lamps, which tends to clog the mechanism. The Osmium lamp gives a pleasing white light; but unfortunately the filament is very fragile, and the pressure which can be applied to it is very low. Referring to the tantalum lamp which we noticed last week, Professor Davidge congratulates the inventors upon their patience; but he has nothing better to say than that they have foreshadowed that other metals, with exceedingly high melting-points, may be shortly pressed into the service of the lamp manufacturer. Mr. Robert Hammond has shown that the average life of the Nernst lamp is short as compared with even the incandescent lamp, and the first cost high. But the efficiency is "very high" too. To some extent the author's experiences support these statements. It is his opinion that the lamp, *under proper control*, will usually result in a saving of expense. But the other side of the picture is that he has tried a few of the lamps, and they have not been very successful in the matter of life; but it is, he thinks, probable that the result in his case was due to the bad pressure regulation on his circuit, which is local. Again, mercury vapour lamps in efficiency are said to promise well; but they suffer from one great defect in the colour of the light emitted. Cathode bombardment lamps are not so far a practical form of lighting. From all which it will be seen that the final solution of the electric lamp problem has not yet been reached; and who can counsel the inquirer who wishes to carry the development a stage further? The ability to do so is even beyond so keen an observer as Professor Davidge. His paper will have the opposite effect to an encouragement of any perturbation in the minds of those who are concerned in the fortunes of the gas industry.

Who says fire? The electricians are incensed over the publicity given by the "Daily Telegraph" to the destruction of famous mansions, with their priceless art treasures and other valuable property, through fire—our popular morning contemporary regarding the matter as one of great national importance. Unapproachably superior as electrical engineers may consider themselves in the ranks of the profession, they, when under attack, show they are, after all, subject the same emotions as ordinary humanity. There are those who look fairly and squarely in the face the patent or circumstantial evidence, as the case may be, as to many of these fires having been occasioned by electrical installations; while there are others who have been stirred up to a perfect rage by the charge levelled against their dearly beloved electric lighting. This is seen by the correspondence that has during the past week been running in the "Telegraph." It is anything but electricity that has brought disaster to these noble residences. The bad setting of fire-places, wooden beams carried above or below the fire-places, or anything else which can be indicted, is, in their opinion, more likely to have caused this fearful destruction of property which can never be replaced. But it is curious—it is a remarkable illustration of the perversity of mundane things—that while these mansions should have stood for ages, there should have been such a crop of disaster within a limited period, and that period well within the years of the electric lighting of these mansions.

On the other hand, there are (the correspondence shows) those electricians who are not prepared to deny that the evidence on all hands looks black against electricity as being the source of many of these conflagrations. Even though they are loath to admit it without shielding their statements with a little vagueness, their confessions of cutting competition and looseness of original design being responsible for bad and careless workmanship, disclose the doubt

which possesses their souls as to the innocence of electricity in this matter. There is shoddy material, inferior workmanship, indifferent installation plans, a neglect of details to attain perfection, and a want of proper supervision in much of the electrical work that has been, and is now done, as in most other things. But it is singular if all these country mansions have suffered from these deficiencies in obtaining the best installation, where the price for the greatest perfection cannot surely have been denied. It is said that infallible wires, fixtures, and methods are open to all. But, without exception, the corresponding electricians advocate that there should be a rigorous supervision by a qualified person at the installation, and a periodical inspection afterwards made. This suggests that infallibility is but the creation of the imagination. If the consumer is to bear the expense of periodical examination by a skilled person, this will make his electric lighting even a greater "luxury" than it is at present. That it is an essential accompaniment of electric lighting is seen by reading the evidence in the case of the fire at a west-end mansion, which case was in the Courts last week. The danger is not confined to mansions, nor is the necessity of inspection. Many of the modern houses, which are not classed as mansions—some of them being known as "flats," others as "jerry-built"—are said to contain installations of a cheap and nasty order. It behoves all users of electricity—whether they occupy mansions or flats, or anything of an intermediate character—to see that their electricity fittings are in good condition, and that they are so maintained. Only in this way, judging from the electricians' own monitions, can there be anything like a sense of security—that is, if "security" is the proper term to use in the circumstances. Here it is convenient to mention that, incidentally remarking upon our recent references to electric lighting wires assisting to transmit fire over a building, one of our electrical contemporaries observes: "It would be interesting to compare, in this respect, an installation of electric wires with a similar installation of gas-piping in a burning house. There is little doubt as to which would prove the more easily extinguishable." This raises some interesting reflections. Gas will only burn at the points of outlet; and the pipes themselves cannot act as conductors of fires. The remarks last week were founded on personal observation; and the way the fire crept along the electric lighting wires convinced the writer that they did, in that instance, and wherever such wires were insulated and run in similar manner, constitute "a source of grave danger."

The Dublin Corporation have put their final seal on the question of whether they will retain the working of the electric lighting undertaking, or accept one of the quixotic offers of Mr. Robert Hammond. They have determined to do the former, just as everybody—including, there is every reasen to think, Mr. Hammond himself—thought they would. Concurrently with this report comes the information that the Irish Local Government Board have been moved to sympathy for the ratepayers of the city. A communication from them, dealing with the recent inquiry for a further loan (which is to be sanctioned), indicates that they are of opinion that the Corporation are not yet in possession of "clear and comprehensive information" as to what is required to convert the celebrated Pigeon House scheme "into a successful undertaking." The Corporation would dance with joy if they were in possession of such information; as they are not, perhaps the Board intend their remark to be taken as a reproof by the engineering advisers of the Council for not having before this supplied such information. The Board urge that the Corporation should, without delay, apply themselves to the really serious questions raised at the inquiry as to how the general scheme could be improved, in order to prevent annual loss to the ratepayers. The solicitude of the Board will no doubt be appreciated by the ratepayers; but it requires more solicitude than even a Government Department has at command to mend a state of affairs such as exists at Dublin.

Someone not long since made some caustic remarks about professional men who predicted for municipalities and ratepayers rosy results from what they themselves must know to be visionary schemes. We wonder what the people of Worcester think now about all the foolish statements made at the time when it was thought that they were going to generate electricity almost for nothing at the Powick station by means of water power. It is a long time since we read the beautiful, prophetic utterances; but from the day the dream passed, the people of Worcester have learnt that all is not powerful that flows. The report of the Electricity Department for last year has just been issued; and the anticipated deficiency for the year of £670 has grown to £1220 16s. 3d. Bad as have been former experiences at Powick, never has the department obtained such little assistance from the water power as during last year. In flood, the turbines would not work; and so it cannot be expected that they would in drought. The run of water power alone did not average more than 7½ hours a day, and then only on the lightest possible load. The misfortunes of Worcester in this respect are the outcome of misplaced confidence; and as such they may be added to the warnings with which municipal trading in electricity so freely supplies us.

At the last meeting of the Coventry Corporation, a unanimous recommendation of the Gas Committee that the salary of the Gas Engineer and Manager (Mr. Fletcher W. Stevenson) should be increased by £100 per annum gave rise to some discussion, but was eventually carried by a substantial majority.

DEPRECIATION VERSUS SINKING FUNDS.

The question of the proper method of depreciating the plant of municipal trading undertakings is one of endless controversy. From the point of view of the accountant, depreciation should be charged in regard to all undertakings liable to waste, obsolescence, or supercession, on terms quite sufficient to recoup or renew the assets when required—repairs being charged to revenue year by year so as to maintain the assets permanently in efficient condition. The enforcement of some such rule is especially necessary in the case of electricity and tramway undertakings, where the wear and tear of plant are exceptionally heavy, and the margin of profit (if any) is small. In many cases of this kind, corporations are content with the fulfilment of their statutory obligation to set aside a certain sum as sinking fund for the extinction of the debt; leaving for the future the question of how worn-out and obsolete plant is to be replaced. There is, no doubt, trouble in store for many of these bodies. Torquay is already in difficulties for want of a depreciation fund in connection with its electricity works. The proposed removal of the works to a new site will, if it is carried out, send some of the present plant to the scrap heap; and the cost of its replacement will fall as a direct charge upon the rates—much to the disgust of that section of the ratepayers which is not bitten by the municipalizing craze.

In other cases, the results seem likely to prove as real, if not so immediately apparent. A recent report by the Auditor of the Plymouth municipal accounts directs especial attention to the danger. It is pointed out in connection with the tramways that a sum of £5703 must be allowed for depreciatien if the life of the plant is to be taken as equivalent to the period of years for which the money is borrowed; while the items of stock redemption fund and special redemption fund appearing in the balance-sheet amount to only £4663. In regard to the electricity works, the case is worse; for there the depreciation on the basis of the number of years is £5658, and the charge for stock redemption only £1679. The depreciation fund as it exists is limited to the point of view of dealing with the wear and tear of machinery, but makes no allowance for the obsolescence of plant. The Auditor goes on to observe that the essence of the whole question is whether it is the policy of the Corporation to hand over, when the present loan debt has been extinguished, an undertaking in full working order, and with a sufficient reserve to admit of its being placed in its original state of efficiency, or, alternatively, for the provision of more up-to-date methods. If that is the view which corporations are to take of their responsibilities, much less will be heard of the profit of municipal undertakings. Up to the present, it is true, the profit in the vast majority of cases has been rather in what is expected than in the result attained. Were perpetual maintenance to become a necessary charge, and corporations required to keep their undertakings in an efficient state without recourse to further loans for renewals, the whole aspect of things would change. In the meantime, there is room for an authoritative pronouncement on the question. Whether there should be an allowance for renewals, and what it should be, ought not to be left open to argument. It has been urged by those who approach the subject from what may be described as the municipal standpoint, that the practice of the Local Government Board should be altered, and that in granting loans the system of equated payments to a sinking fund be abolished in favour of one which will more accurately represent the real conditions with regard to the life of the several portions of the undertaking.

The reply of the Finance Committee of the Plymouth Corporation to the remonstrances of the Auditor is that the sinking fund is calculated on a basis which will repay the total amount borrowed in a certain number of years. This is true; but it does not meet the difficulty that some of the assets are wasting much more rapidly than others. The land which is part of the cost will remain; and the buildings, if they are substantially erected, may last eighty or a hundred years. The machinery, however, may be gone in ten years, and the amount put aside as sinking fund under the equated system be totally inadequate to meet such a waste. If the sinking fund or depreciation fund were based on the estimated life of the different classes of expenditure, and the allowance put at a sufficient sum to maintain the whole of the undertaking in a state of efficiency, a desirable change would at once be made.

Masonic.—Last Tuesday Bro. E. J. Brockway was installed W. M. of the Lord Worsley Lodge (No. 3017) at Cleethorpes. The Installing Master was W. Bro. the Rt. Hon. the Earl of Yarborough, Provincial Grand Master of Lincoln, who was assisted by W. Bro. F. Moss, P.P.S.G.W., and W. Bro. Sir George Doughty, M.P.

Estimation of Carbon Monoxide in Confined Spaces.—In an article in a recent number of the "Comptes Rendus," MM. Albert Lévy and A. Pécoul gave the results of their estimation of the amount of carbon monoxide in various schools, hospitals, tunnels, &c., in Paris, by M. Gautier's system. This method is founded on the reduction of anhydrous iodic acid at a temperature between 60° C. and 80° C., and absorption of the iodine by chloroform. The authors find that absolutely all the iodine liberated is retained by the chloroform—the method being therefore quantitative.

GAS SUPPLY IN TIMES OF TROUBLE.

Lighting St. Petersburg during the Crisis.

THERE was at least one cause for thankfulness during the recent lamentable outbreak in St. Petersburg—namely, that the process of gas making was enabled to be carried on uninterruptedly. Even in times of perfect quiet, a general strike at a gas-works is a serious affair; but during periods of internal disorder, such an occurrence is a positive menace to the public safety, and one can faintly imagine what a terrible addition it would have made to the horrors of the awful nights of suspense which followed the affray which took place between the military and the strikers on Sunday, the 22nd ult.

Naturally, perhaps, the gas workers took advantage of the opportunity that the labour upheaval offered, to secure better terms for themselves; and Mr. Paschenko, the Engineer at one of the Gas-Works, informs us that the men employed by his Company sent a deputation to the office to submit their claims. In view of the exigencies of the situation, these were satisfied; and thus the workers did not participate in the general strike. The men appear to have known pretty well what they wanted; indeed their demands, as will be seen, bear evidence of having been formulated with some amount of care. They asked: (1) For an increase in wages from 20 and 25 to 25 and 30 roubles per month; 3 roubles per month extra to be paid to those who had not free lodging on the works. (2) For full pay to sufferers from accidents until recovery, or until the decision of the Tribunal, if the matter was placed before them for settlement. (3) For payment of half-wages for a period of two weeks to workmen suffering from ordinary disease, provided this was certified by the physician. (4) For the use of a smaller hand-charging scoop. The weight of the scoop, it may be mentioned, was about 90 lbs., and the net weight of the coal about 130 lbs., or a total of from 220 to 230 lbs.

That the city authorities were fully alive to the importance of keeping up the supply of light and water is evidenced by the fact that the Chief of Police (without being applied to) sent detachments of soldiers into the works, to prevent strikers entering and forcing the workmen to leave. The result was that all the gas-works, electric stations, and water-works looked like fortified islands in a sea of idle factories and shops. For many days Mr. Paschenko had soldiers inside and outside his works, with sentries guarding the gasholders, meter-house, purifiers, and coal heaps; and all the time the troops were prepared to fire at a moment's notice. In this connection, one may remark the value of the telephone as an aid in the suppression of street rioting; these instruments having been employed from time to time to inform the different soldiers that crowds were moving in their direction, when they promptly formed line to await events. The electric light stations were not quite so fortunate as the gas-works; for on the day following the outbreak the men at some of them were overcome by fear, and took themselves off. Sailors were soon sent to re-start the engines; but there was unfortunately an interruption of some hours, and a portion of the principal streets lighted with electricity were plunged in darkness.

As was to be expected, there was a considerable number of breakages of lamp glasses, &c.; the following figures having been furnished by the Municipality with regard to all kinds of lighting: Broken lantern side-glasses, 1705; glass cylinders, 260; reflectors, 111; and lamps, 224. The gas consumption, however, does not show such a falling off as might have been anticipated in view of the almost total suspension of business during the most threatening days. Mr. Paschenko states that the consumption on Sunday, Jan. 22, was 1,438,000 cubic feet, as against 2,181,000 feet on the corresponding day last year (which, of course, was not a Sunday); while next day the figures were respectively 1,763,000 feet and 2,207,000 feet, on the Tuesday 1,818,000 feet and 1,645,000 feet (a Sunday the previous year), and on the Wednesday 1,937,000 feet and 2,198,000 feet.

New Method of Laying Concrete.—An unusual concrete wall for a cylindrical water-tank has been constructed by Mr. J. F. Lyman, of Modesto (Cal.). The novelty consists in the method of carrying out the work, which is described in the "Engineering Record" as follows: Within the forms for the outer and inner faces, collapsible cylindrical forms, of a diameter somewhat less than the thickness of the wall, were placed vertically at intervals. These were perforated with several holes, and were inserted for the drainage of the fresh concrete. The space between the outer forms was filled with concrete, which was given an overnight set; then the water which had collected within the cylindrical forms was drawn off, and the space occupied filled with concrete. The hollow cylinders contained at the end of ten or twelve hours from 2 to 6 inches of clear water, which had drained into them from the concrete. The object of providing this extra drainage was to procure a more uniform set through the cross-section of the wall. A large number of concrete structures have been built by Mr. Lyman, including the head gates, waste weirs, drops, and highway bridges on a large irrigation project; and he states that concrete laid by the method described is unusually uniform in strength, free from cracks, and quite homogeneous in appearance.

LADY INSPECTORS FOR COOKING-STOVES.

By GEORGE STEVENSON, of Long Eaton.

I have read with much interest the article in the "JOURNAL" for the 24th ult. on the "Services of the Lady Lecturer and Teacher," and have also had pleasure in perusing the ensuing correspondence in which we have the benefit of the advice of several professional ladies. The suggestions made in the article are, in my opinion, most opportune, and are deserving of careful consideration at the hands of all gas authorities who hire gas cookers on anything like a large scale.

It is now generally agreed that the old method of holding exhibitions is rapidly dying out, and that some further method is desirable with the object of keeping in constant touch with the users of gas-cookers. The writer of the article in question says that, to the best of his knowledge "the idea of house-to-house visitation has never been tried or entertained in this country;" so that I thought it might be of interest to readers of the "JOURNAL" to give the result of an experiment in this direction carried out three years ago by my Company.

The circumstances were as follows: In the early part of 1902, the Directors of this Company decided to undertake a large scheme of slot installation. There were at the time a considerable number of houses in the town which were not supplied with gas; and the writer (believing in the virtue of printer's ink) gave wide publicity to the scheme, with the result that we were soon flooded by applications which were dealt with on their merits. A large number of slot cookers were fixed, as is the case in most other towns. These cookers were of an up-to-date type, and first-class in every respect. I quickly perceived, however, that fixing the cookers was only *partly* doing the thing, as I found many of the people were totally ignorant of their proper and economical use. This being so, I had, in the first place, special instruction cards printed, giving (in language which could be easily understood by our consumers) hints on the best use of the cooker, &c. These cards were sent out to each consumer, accompanied by a post-card (copy of which is attached to these notes), intimating that a lady would call in the course of a few days. The consumers were scheduled in street order; and the lecturer every evening posted a certain number of post-cards to those consumers she intended calling upon the next day. Throughout the whole of the town, she met with a cordial reception; and in only an odd case was there a feeling of resentment and incivility.

Weekly written reports were sent in to me, giving full particulars; and I discussed these reports personally with the lecturer at intervals, when any repairs or improvements were immediately carried out.

The first thing she did on visiting the house of a consumer was to take the cooker to pieces, and thoroughly explain its use; being very particular to emphasize the necessity of keeping everything clean and in good condition. In many cases, the lecturer agreed to call on some convenient day, and cook the dinner for the consumer; the effect being that the cooker was used "ever afterwards."

The effect on our wear and tear account has also been most apparent, and increased consumption, due to the thorough instruction given, has been often noted. In a few cases, where the cookers were not being used, they were promptly brought away; thus saving further capital expenditure.

In every case, however, where *education* would result in gas being used, no effort was spared. The experiment was a splendid investment; and the moral effect, so to say, was certainly worth something.

It will be noticed that only slot cookers were touched, though I am quite convinced that, in most towns, a lady lecturer on the permanent staff would recoup the cost involved many times over. Speaking from experience, I should, however, think that, with the ordinary customer, the fact of having such a member on the staff should be thoroughly well advertised, and that applications for her services should emanate from the consumers themselves. I should feel very cautious about undertaking a house-to-house visitation, unless I was perfectly certain that I understood the people in the district. That is sufficiently explicit.

With the above notes, Mr. Stevenson forwarded a copy of the cards distributed among the consumers, which set forth, in clear print, some simply-expressed instructions for using gas-cookers for various purposes, together with some sound advice. The wording on the card sent with these instructions was—

Gas Offices, Long Eaton.

Please hang the Instruction Card sent by Bearer near the Cooker.

A Lady will call on you in a few days, and will be pleased to give any information with regard to the Cooker, and its proper and economical use.

The post-card sent out by the lady lecturer each evening to each consumer upon whom she intended to call next day had printed upon it the following notice.

Gas Offices, Long Eaton.

Dear Madam,—I have arranged for Miss CLEGG (First Class Diplome in Cookery) to call on you to examine your Gas-Cooker, in order to see if it is in good working condition.

If you have found any difficulties or faults in the working of the stove, Miss Clegg will be glad to give you any help you may require.

GEO. STEVENSON, Secretary and Manager.

The sample reports which Mr. Stevenson forwards as to the results of Miss Clegg's visits are very interesting. Each entry is prefaced by the date of visit and address. A few specimen reports may be given—

Oct. 7. (Address.) Little cleaned. Flue pipe not long enough. Bad smell when cooking meat in oven. Explained cooker, and gave its advantages.

Oct. 7. (Address.) Well used. Clean. Explained griller, and the hanging of meat in oven. Gave advantages of cooker.

Oct 7. (Address.) Well used. Clean. Thoroughly explained cooker and gave its advantages for ironing.

Oct. 7. (Address.) Well used. Dirty. Explained construction and necessity for keeping cooker clean. Gave its advantages.

Oct. 7. (Address.) Well used. Clean. One of the taps loose. Causes bad smell. Well understood.

Oct. 8. (Address.) Well used. Dirty. Explained cooker and gave its advantages. Flue-pipe passes into copper chimney. When copper is used, cooker is filled with soot. Kitchen filled with smoke on washing days.

Oct. 8. (Address.) Well used. Clean. Flue-pipe fixed as in last report. Causes great inconvenience.

Oct. 8. (Address.) Well used. Clean. Explained cooker and gave advantages. Meter wrong; needs screwing up. Not home in daytime.

Oct. 8. (Address.) Well used. Very dirty. Explained construction and necessity for keeping cooker clean. Gave advantages of cooker. Set in awkward position.

Oct. 8. (Address.) Bad leakage in house. Unable to use gas. Explained cooker and necessity for keeping clean.

Oct. 8. (Address.) Explained construction and necessity for keeping clean. Cooker not level; requires re-setting.

Oct. 8. (Address.) No flue-pipe fixed. Causes bad smell when using oven. Would like one fixed. Explained cooker.

These are only a few examples selected from the reports of two days only, to show that there is work—and beneficial work—to be done, both on behalf of the gas supplier and consumer. Looking down further reports, it is noteworthy that out of (say) every dozen stoves, there are at least four against which "dirty" or "very dirty" appear. "Griller not understood" and "griller little used" are also frequent statements. In a report for a day or two later, it is seen that the visitor came across, in the particular localities visited, some houses where no cookers were fixed; but in those of which she made note, cookers are now to be found. Altogether, there are now above 3000 cookers in use in Long Eaton and Sawley.

Although not bearing upon the special subject of Mr. Stevenson's communication, it may be mentioned that, among the literature which he sends, there is a sheet showing that the Company are taking a special interest in the supply of gas for power purposes. From August last, the charges have been: 2s. 1d. per 1000 cubic feet for a consumption of under 40,000 cubic feet per month; 1s. 10d. for a consumption between 40,000 and 80,000 cubic feet per month; 1s. 8d. for a consumption of between 80,000 and 130,000 cubic feet; and 1s. 6d. for over 130,000 cubic feet. Maintenance and the supply of gas-fittings at cost price are among the other business-promoting methods of the Company.

Miss M. S. BIRKETT writes:

I have read with much interest the article in the "JOURNAL" on "Lady Lecturers."

I quite think the suggestion of having a lady attached to the gas company is very beneficial to show the advantages of cooking by gas, which are many. For the past two years my friend Miss Wilkinson and I have had a school of cookery, in Southport, in connection with the Gas Committee, which has proved most successful for both parties. There are two lectures weekly open to the public, when the uses and the working of the stove are explained. These lectures have been much appreciated by ladies and cooks. The remaining days of the week are devoted to lessons in practical cooking.

We have a handsome show-room, in the best part of the town, and a hall at the back, where lectures and classes are held.

I do not advocate the visiting from house-to-house by ladies, as I think that this is more suitable for, and better done by, men. But we are always ready to explain any difficulties there may be in the management of gas-stoves; and several ladies and cooks have been glad to avail themselves of our services.

We have always found the Gas Committee willing and ready to help us in any way; and I am sure that much good can be done by the lecturers in instructions as to the uses of gas for cooking, and also in the art of cookery itself.

I hope your article will meet with the success it merits.

249, Lord Street, Southport.

ELECTRIC LIGHT AND TRACTION DIRECTORY.*

THE electrical industry appears to suffer from an over-supply of almost everything—from its plant-manufacturing concerns down to its literature. There is now every appearance of it being overdone with directories and statistical and other information concerning the electricity supply and traction undertakings of the kingdom. At the same time, this does not preclude the saying of a good word for good work; and in the "Imperial Directory of Electric Lighting and Traction" which has just passed through the press, under the editorship of Mr. C. S. Vesey Brown, we have a volume into which a large amount of excellent work and care has undoubtedly been put. The edition now before us contains several improvements and additions which enhance both its value and usefulness. Though these additions have imparted to the volume a somewhat more portly appearance, they are welcome for the rounding-off which they give to information in various sections dealing with lighting and power, tramways, light railways, and standard gauge and tube railways. Mr. Vesey Brown has been smitten by imperialism, and has in this volume done his part in assisting to encourage the mind to look upon the British Empire as a unity; for, in enlarging the Directory, he has included the works of India and the Colonies, which supply a new feature of considerable interest. Looking generally at the book, the information under each heading is of a comprehensive order for a work of reference of this class; and, in many instances, particulars are given from capital and revenue accounts. It always induces a feeling of assurance to learn that the compilation of such returns has been effected by the assistance of those directly responsible for the management of the different works. This Mr. Vesey Brown is able to say; and, on this account, and from an inspection of the contents of the book, we feel confidence in recommending it to our readers who are interested in having at hand the affairs of each electricity undertaking in the empire arranged in compendious form, though the volume itself is of a somewhat substantial character.

GAS-PRODUCERS FOR POWER PURPOSES.†

AN unpretentious little handbook is the one before us, in which we have explained the advantages, action, and application of gas-producers in language so studiously non-technical that it may be recommended to even the tyro in these matters, after warning him that the author is more at home in the matter of producer gas than in that of coal gas, and that he does not in the volume establish his authority sufficiently to have all his assertive statements accepted without close examination being made into the claims of the principal competitor of producer gas for power purposes of ordinary character. It is especially necessary that this remark should be made, as we see that the book is particularly addressed to "purchasers of power-producing machinery, as well as to the erectors who instal, and the attendants to whose intelligent care the machinery is entrusted." Upon which it may, in passing, be remarked that it is usually "erectors who instal," and that it is abundantly plain, from the statements in the book regarding the dangerous character of producer gas, and from the chapters headed "Hints to Attendants" and "General Remarks," that it is very necessary for the attendants to be endowed with a goodly supply of "intelligent care." But purchasers of power-producing plant are another set of people. They are inquirers and buyers; and our author—Mr. W. A. Tookey (whose little book on "Gas-Engines: Their Advantages and Application" has been in excellent demand)—would have done them perhaps a greater service, if he is able to write without prejudice, or is qualified to deal with the subject, by extending his book so as to include fairly and fully the claims and conveniences of ordinary coal gas to consideration in comparison with producer gas, in order that purchasers of power-producing machinery might have before them, in the one volume, the whole range of choice which they have from which to purchase. We emphasize the term "conveniences;" for we have had instances brought to our knowledge where the uniformity in the quality of the coal gas, the absence of the trouble of a gas-producing plant, and the convenience of getting power by simply turning a tap have led to the abandonment of the producer. The author, however (having in view the instructive pretensions of his book), inconsiderately limits purchasers in their choice; and perhaps his answer will be that this is no business of his, as his interests lie nearer to the use of producer than coal gas.

This seems to be quite clear from the introductory chapter to the book, for there we find some very elementary remarks on coal gas—in fact, the whole process of coal-gas manufacture is "described" in some ten lines, in the course of which we find gasholders referred to as "large reservoirs." Again we are told that the manufacture of water gas has been of late years carried on in gas-works "to cheapen the cost of the production, and to obtain large quantities in a few hours." Apparently the author

* The "Imperial Directory of Electric Lighting and Traction. 1905." Edited and compiled by C. S. Vesey Brown, M.Inst.C.E., M.I.E.E. London: Hazell, Watson, and Viney, Limited.

† "Gas-Producers for Power Purposes." By W. A. Tookey. London: Percival Marshall and Co.

does not know that, while the latter part of this statement is true, the "cheapening of the production," through the aid of carburetted water gas, is a matter upon which many gas engineers who are daily employed in making coal and water gas would tell him that, under normal conditions, the manufacturing costs of the two systems have a happy knack of working out at about the same figure per 1000 cubic feet. That Mr. Tookey believes the one is commonly cheaper than the other is seen by the definite remark on another page that "the cost of production is less" for carburetted water gas than for coal gas. From which introductory matters, we are led to doubt somewhat the competency of Mr. Tookey to get outside the subject of producer gas, and to give advice that is worth having in connection with coal gas. There are one or two other statements in the introduction that might be similarly commented upon; but it is unnecessary to labour these matters. If the book is taken up with the view of obtaining, in brief and plain form, the best that can be said for producer gas for power purposes, and the fact is kept ever-present that the author has a particularly strong leaning towards that gas, then its reading and study will be a useful exercise for even "JOURNAL" readers. Their technical knowledge will enable them to detect the weaknesses of, and drawbacks to, the producer gas system; but all purchasers of plant are not in the same position. The book has the merit of being cheap and in handy form, so that gas engineers can readily look into its pages, and form judgment upon it on their own account.

PERSONAL.

Mr. W. E. CATON has obtained the appointment of Chief Assistant at the Cavendish Street works of the Derby Gas Company, in succession to Mr. John Power, who, as recently announced in the "JOURNAL," is going to Sheffield. Mr. Caton was articled to Mr. W. R. Phillips, the Engineer and Manager of the Luton Gas and Water Companies, and was afterwards his Assistant for two years and a half. For the past three years, he has been Assistant to Mr. H. Fowler, Gas Engineer to the Midland Railway Company. He holds several certificates, including one in the Honours Grade in "Gas Manufacture."

OBITUARY.

ALEXANDER SMITH.

IT is with much regret that we announce the death, on the morning of the 6th inst., at his residence in Aberdeen, of Mr. Alexander Smith, who was for many years Gas Engineer and Manager to the Corporation of the city. Deceased was born in Aberdeen on Oct. 13, 1836, and was thus in his 69th year. He served an apprenticeship as blacksmith and engineer with the firm of Messrs. M'Kinnon and Co., of Aberdeen, and afterwards came to London, where he was employed for some time as draughtsman with Messrs. Easton, Amos, and Co. He subsequently, however (in 1863), returned to his native city, to take the position of Manager of the works in which he was apprenticed. While thus employed, the Aberdeen Gas Company extended their works, and Mr. Smith superintended the alterations. When they were completed, he was offered an appointment as Assistant-Manager of the Company, which he accepted. This was in 1866. Five years later the undertaking was acquired by the Corporation, and Mr. Smith was selected as Engineer and Manager. He continued in this post till August, 1903, when, owing to his infirmities, he was relieved of his office, and granted a retiring allowance; Mr. Samuel Milne, his Assistant, being appointed to succeed him. It is widely known with what marked ability Mr. Smith conducted the affairs of the gas undertaking. When he took charge of the works in 1871, the quantity of gas manufactured was rather less than 146 million cubic feet; the price being 5s. 5d. per 1000 feet. In the year of his retirement, the make was 641 millions; and the price had been reduced to 3s. per 1000 cubic feet. As was to be expected, being an engineer, his works were at all times up to date in the matter of repair as well as in equipment. He looked far afield, and spared no pains to make himself acquainted with whatever was new in the gas world. As their trusted Manager, he was able to do much good work for the Corporation. His sound judgment in the schemes he brought forward, and the time of presenting them, were recognized to the full. He had but to mention that a thing was required, and it was at once procured. Indeed, before it was actually required, he had erected a gasholder which was larger than any outside of London and Glasgow; bringing his proposal for its erection forward so opportunely, and engineering it in such a way, that it was the cheapest of all large holders at the time it was put up. He was among the first to adopt the regenerative method of firing retorts. He had his works connected with the harbour by means of a railway laid along the streets. He began the manufacture of cyanogen about the same time that it was introduced into the Glasgow Corporation Gas-Works by the late Mr. Foulis. He was the first in Scotland to erect and work inclined retorts, as part of the plant. The Arrol-Foulis stoking machinery was introduced by him with so much celerity that it might almost have been said that he was waiting for something of the kind to be brought out. In these and other ways, the gas-works in Aberdeen were kept to the front in every department. After his retirement he lived in an enfeebled, though not a disabled, condition, for on the day before his death he was out of doors. That evening he was seized with cerebral hæmorrhage, and passed away early next morning. He is survived by a widow, six sons, and a daughter. The eldest son, Mr. A. Smith, is the Manager of the Tradeston Gas-Works in Glasgow. The second is an Electrical Engineer in London; the third is a Solicitor in Aberdeen; the fourth is Manager of the electricity works at Durban, South Africa; the fifth is a Chartered Accountant in Glasgow; and the youngest is Assistant-Manager of the Aberdeen Gas-Works. Mr. Smith was a member of the North British Association of Gas Managers, was President at the meeting of the Association in Edinburgh in 1879, and read a paper on "Sunday Labour in Gas-Works" in 1884. Last year he was placed among the honorary members of the Association. He was a member of the Aberdeen Hammermen's Incorporation, the various offices in which he held at one time or another. He was one of the original Directors of the Aberdeen Steam Laundry Company, and also of the Aberdeen Mechanics' Institute, in which he was at one time a drawing master. He was also an office-bearer in the United Free Church. At a meeting of the Town Council of Aberdeen on Monday, feeling reference to his death was made by Mr. Kemp, the Convener of the Gas Committee, by Lord Provost Walker, who said he looked upon Mr. Smith as one of the best servants the Corporation ever had, and by Mr. Johnston, a former Convener of the Committee. The Corporation unanimously adopted a minute expressing their deep regret at the death of Mr. Smith, and their sincere sympathy with his widow and the family. The funeral took place on Thursday, at St. Peter's Cemetery, Aberdeen. Upwards of 300 of the employees at the gas-works preceded the coffin; and it was followed by the chief mourners, the Lord Provost, magistrates, councillors, and a large number of the general public.

Much regret is felt by the Belfast Gas Committee at the death of Mr. ALEXANDER TURNBULL, the Cashier. Mr. Turnbull was appointed to his position by the Gas Company in 1849, and was retained when the Corporation took over the undertaking in 1874. The Committee have passed a resolution recording their high appreciation of the upright way in which Mr. Turnbull discharged his duty, and tendering to the family sincere sympathy in their bereavement.

Mr. JAMES MACHALE, the Convener of the Gas and Water Commmittees of the Hamilton Corporation, died on the 6th inst. As the result of attending a water inspection which took place early last month, he had an attack of influenza, and congestion of the brain ensued. Mr. MacHale was a jeweller, and entered the Town Council of Hamilton in 1894, and in the same year was made a Magistrate. In 1895 he was appointed Convener of the Gas Committee, and held the position till his death. During his convenership, very considerable additions were made to the gas-works. As Convener of the Water Committee, he superintended the undertaking during the construction of the works recently completed for the introduction of the new water supply.

The death took place on Sunday, the 5th inst., in his 59th year, of Mr. THOMAS LEA SHEPPARD, who for 27 years filled the position of Manager of the Farnworth and Kearsley Gas Company. In early life he was engaged at the Salford Gas-Works; but in 1876 he succeeded at Farnworth Mr. W. Smith, who had had the management of the works from the formation of the Gas Company in 1854. During the time he had charge of the concern, the price of gas was reduced from 3s. 9d. to 2s. 8d. per 1000 cubic feet, and the annual consumption increased from about 70 million to 136 million cubic feet. Owing to failing health, Mr. Sheppard tendered his resignation in 1902; but the Directors were unwilling to lose his services, and did not accept it until September in the following year, when they made him an adequate retiring allowance, and he received a handsome testimonial from the workmen and the Board. The funeral took place on Thursday, at Farnworth Cemetery; among those present being Messrs. J. W. Watkinson (Chairman), W. Bromley (Secretary), and H. Pickford (Manager), representing the Gas Company, and Mr. H. Kendrick, of Stretford, from the Manchester District Institution of Gas Engineers, of which the deceased had for many years been a member.

The term "reinforced concrete" has received the approval of the American Society of Civil Engineers for a combination of concrete strengthened by strips of steel to resist tensile and shearing stresses.

Probate of the will of the late Mr. Charles Horsley, whose death was announced in the "JOURNAL" for the 10th ult., has been granted. Deceased left property of the total value of £67,443, including net personalty to the amount of £66,565.

A furnace has been designed by M. Gomes Himalaya for the purpose of obtaining very high temperatures by the aid of reflected solar heat; and it is stated that temperatures above 3500° C. are looked for. The reflector is built up of 6170 elementary mirrors, each 122 mm. by 100 mm., arranged side by side in parallel rows, and are attached by threaded standards to a series of parallel angle-irons, which run horizontally across the frame. The width at the top is 35 feet; at the base, 18 feet; and the depth is 35 feet. With a much smaller furnace previously constructed on similar lines, a temperature of 2000° C. was obtained.

IN DEFENCE OF THE "DOWSER."

In the last issue of the "Journal" we endeavoured to lay before our readers an impartial presentment of the *pros* and *cons* of water-finding, as expressed in the correspondence on the subject which has for some weeks been going on in "The Times." In the extracts made, we purposely refrained from quoting from the letters of professional "dowsers," for the reason that the writers would scarcely be inclined to depreciate the value of their services by recording failures. At the same time, it seems only fair that they should have a hearing; and this we propose to give them in the present article. And as the correspondence has revealed the fact that the possession of the gift or idiosyncrasy of water-finding is not confined to persons who exercise it for the purpose of gaining a livelihood, to exclude whatever evidence they may be able to adduce would be equivalent to asking for judgment on a case upon an *ex parte* statement. We will therefore allow the successful water-finders, both professional and amateur, to give their views on the question under consideration.

The first testimony shall be that of a "dowser" of forty years' experience in the East of England. He says that for a very long time he had to contend with much opposition in the nature of scepticism; but, having had hundreds of successful cases and proofs, landowners, estate agents, and others, in that part of the country, would not think of sinking a well without first seeking the aid of a diviner. This writer appears to have submitted himself to a test very much on the lines of the one proposed by Mr. Wertheimer in the letter which opened the correspondence. He invited the members of a local Scientific Society to witness a series of experiments, the result of which was to demonstrate the possession of his power to locate springs; but neither he nor the spectators could define the exact nature of that power. He himself rather favours the popular theory that there must be some magnetic current set up by the water when travelling through the earth, and that certain persons are susceptible to its influence. His experience has taught him that underground water runs in veins, and that it is upon these only that wells should be sunk. The "dowser," with the aid of his twig, is able to locate the veins by means of a special endowment, the exact nature of which he, quite as much as those who employ him, is desirous of being made the subject of scientific investigation.

This point is emphasized by another correspondent—a water-finder of thirty years' standing, practising on the opposite side of England. He experiences, when walking, with a forked twig or wire in his hands, over ground beneath which there is water, a feeling of "vibration in both arms, which ascends with lightning rapidity, and seems to centre in the heart;" the intensity of the sensation being greater or less in proportion to the volume and head of water. The limits on the surface of the ground within which this sensation may be felt are dependent upon the depth of the source. These phenomena are the same, irrespective of the geological formation. According to this correspondent, there is only one mysterious feature about the art of water-divining, and that is the cause of the peculiar sensation in the diviner to which allusion has been made. This is exactly the point; and it is with the view of ascertaining what this is that Professor Barrett's investigations, already alluded to, were undertaken. The writer of this letter, who is also an engineer, says he has been led to assume that the cause of the "shock," as it may be termed, is of electrical origin, from the fact that when he stands on a dry board, insulated from the ground by glass, supported over a stream which he had previously located in the ordinary way, he feels little or nothing of the sensation, but crossing the stream on horseback does not diminish it.

Another correspondent, writing from Worcester, describes how he was made conscious of possessing the peculiar susceptibility characteristic of the water-finder. Being desirous of sinking a well on his property, he was induced to enlist the services of a neighbour's gardener who professed to be able to locate water, though he had no confidence in the result. He carefully watched the man's movements and the downward motion of the twig at certain places. It thereupon occurred to him to test the powers of the twig himself; and, to his great surprise, it acted in exactly the same way in his hands. He subsequently put his newly-revealed power to very practical use—namely, to discover the position of leaks in a large moat surrounding the house and grounds—and it never failed him. He, however, noticed one singular circumstance, to which allusion had been made by a previous correspondent, that, in most cases, if he held one prong of the forked twig, and some person in whose hands alone the twig would not work held the other, it would move even more strongly than when it was held by himself only. Yet when one of his daughters held the second prong and he the other, there was no motion whatever. She appeared to possess a "negative" influence which overpowered the "positive" influence of her parent. Another most curious circumstance connected with this gentleman's experience was that he found that the divining-rod was affected by overhead as well as underground water. When walking in a garden in Spain irrigated by an aqueduct fed by a pump, he noticed that in passing under an arch over which the stream was flowing the rod moved downwards, just as it does in the case of underground water; but as soon as the pump supplying the aqueduct stopped, it did not move at all when he was passing under the same arch. With this writer, hazel, peach, and whitethorn locate water about equally well, but elm does not; and without a rod he is not conscious of any sensation indicating the presence of water.

Here, then, are some data which should prove useful in an inquiry such as the one now in progress, as they serve to strengthen the conclusion that certain individuals possess, unconsciously, a "peculiarity" in their organization which renders them sensitive to some form of energy emanating from the surface of ground that lies above subterranean streams. It appears from the letter of another correspondent, residing at Monkstown, County Dublin, that this "energy," of whatever nature it is, works less actively in some people than in others. In his own case, for example, it "lagged"—it occupied an appreciable time in becoming visibly operative. Let us now endeavour to find out, from the correspondence, what is the nature of this "peculiarity." First of all we will listen to Sir William Preece. He says there is an external physical action in connection with running water which is sufficient to account for the great majority of the recorded facts. His attention was called to the subject years ago by the suggestion that "dowsing" was an "effect of electricity." He admits that by the proper use of electric currents it is possible to show the existence of water and of metallic veins; but he declares that the so-called divining-rod has "nothing whatever to do with electric or magnetic phenomena," so far as he can perceive. The conclusion he has arrived at is that "mechanical vibration set up by the friction of moving water, acting upon the sensitive ventral diaphragm of certain exceptionally delicately-framed persons," leads to *malaise*, which excites in the "dowser" involuntary muscular action, which is unconsciously applied to the rod, and is indicated by its dipping or rising. Sir William points out that it not unfrequently happens that adepts with the divining-rod make mistakes—water often not being found, though the evidence of its presence was marked. But this, he says, may be due to earth tremors set up by some other cause. Sir William's "vibration" theory received a severe shock from a correspondent writing above initials. While acknowledging that water flowing in pipes or impinging upon an embankment or the piers of a bridge sets up vibrations, he disputed the proposition that it would do so in a bed of gravel or chalk. He pointed out that there is no movement of water in mass under such conditions, but, at most, only an infinity of small movements between solid particles; and if these are supposed to produce infinitely small vibrations, they must continually destroy one another.

The "vibration" theory having been dealt with, let us hear what a geologist—Mr. J. W. Gregory—has to say on the general subject. First of all he states emphatically his opinion that the water-finder is by no means "always either a knave or an unconscious fool," as many would have us believe. He heard reports of the operations of "dowsers" in Western Australia, and three statements attracted his attention. The first was that while the diviners were frequently successful in locating comparatively shallow water where there were no obvious surface indications of it, they failed in places where he knew a thick bed of impermeable clay covered the water-bearing layer. Secondly, the power of divination was stated to be very often hereditary. Lastly, particular atmospheric conditions were said to be necessary to success; those most favourable being when the air was dry and still. Here we come upon what looks like a reasonable explanation of the "peculiarity" to which reference has already been made. Some people are "abnormally sensitive to hygrometric influences;" and consequently they may be able to detect slight differences in humidity which are inappreciable to most people. We have no need to go on a long search among our acquaintances to find cases of this hyper-sensitiveness. Many people are perfectly conscious of approaching rain, even though there is not in the sky a cloud so big as a man's hand; and the reason is, as they jocularly say, that they have "barometers in their boots." Why, again, are others abnormally sensitive to certain atmospheric conditions—listless and apathetic to a degree before a thunderstorm, and bright and active after it has passed? The reply is to be found in the fact that there is then more electricity—more vitality—in the air, and they are stimulated thereby. Is it, therefore, too ridiculous to suppose that certain hygrometric conditions affect the water-finder? Mr. Gregory tells us how one failed to find the great pipe carrying the water to Melbourne when he was taken across the paddock under which it lay. But the man candidly confessed that he was powerless to locate water enclosed in an iron pipe; and others were equally so when the water was covered by an impervious bed of clay, as this acted in the same way as the pipe. Mr. Gregory points out that though the rod must be very light, it is so carried as to cause an unusual strain on the hands of the diviner, whereby his muscles pass into that condition of numbness popularly described as having "gone to sleep." Under such conditions, the nerves of the skin may be exceptionally sensitive to slight external stimulus, which would cause a twitching of the muscles. This stimulus may, it is thought, be imparted by sudden passage across a patch of damper air; and therefore one can readily understand why a wet day is unsuitable for the operations of a water-finder, and why he may go close to a free water surface without feeling its presence, as the change in the humidity in the air would be very gradual.

Before bringing this article to a close, we will allow one more correspondent—Mr. Sydney F. Walker—to give his views on the question under investigation. He declares that there is no magic at all—not even a suggestion of magic—about "dowsing." The

operator is merely the instrument that responds to the "force generated by the underground spring, just as a gold leaf electroscope responds to the force delivered by an electrostatic charge." Mr. Walker then goes on to explain that a portion of the energy present in the water running beneath the ground is converted into a form of energy hitherto unknown and at present without a name, but possessing some of the properties of the other physical forces, and responding to some of their laws. The forked twig is merely the indicator showing the presence of the energy in the "medium." The energy passes from the ground up through the body of the operator to the nerves controlling the muscles of the hands, producing in them the movements which cause the twig to turn. Mr. Walker thinks the sensitiveness to this force or energy is undoubtedly confined to certain persons, but he is of opinion that the number is far less limited than is generally supposed, and includes men, women, and children. He states that "a very common feature in connection with water-finders is discomfort in the presence of electricity"—as, for instance, in the neighbourhood of a dynamo that is furnishing current—" and when the clouds are highly charged with electricity, as they are immediately before a thunderstorm." Here Mr. Walker comes in to support the observations already made as to persons who are hyper-sensitive to atmospheric conditions. Indeed, he says a large number of people are affected in this way; and he regards it as probable that "most of them would make expert water-finders if they cultivated the practice." The sensitiveness to the force varies very much in different individuals, and at different times in the same individual. Ill-health and declining years both affect it; and the operation itself, if carried on for some time, induces exhaustion of the whole body, during which the gift is suspended. All this is perfectly understandable. Mr. Walker thinks the members of the medical profession who have made a study of electricity in connection with the human body will recognize some of the phenomena he has described as being similar to those they have met with in their practice. Having been for some years impressed with the importance of a due consideration for temperament and idiosyncrasy in the treatment of diseases, especially those of the nervous system, and recognizing the great value of electricity as a remedial agent in such cases, the writer of this article freely expresses his entire concurrence with Mr. Walker's closing remarks.

We have now reached a point in the inquiry at which the conclusion appears to be justified that the water-finder is endowed with some occult power which is dormant until its possessor is brought into certain conditions favourable for its exercise. In the next (and concluding) article, we shall endeavour to learn what Science has to teach us in regard to that power.

Proposed Amendment of the Companies' Acts.—The President of the Board of Trade has appointed a Committee to inquire into the above-named Acts, with the object of specifying what amendments are necessary therein. The attention of the Committee will be specially directed to the following questions: (1) The growing practice of issuing companies without a prospectus. (2) The registration outside England of companies carrying on business in England, and appealing to English investors. (3) The extension of the provisions of the Act of 1900 with regard to the registration of mortgages, and charges to include all mortgages. (4) The amendment of Table A of the Act of 1862.

Bye-Products Coke-Ovens in America.—We learn from a communication which has just reached us from New York that the lease of the bye-products coke-oven business of the United Coke and Gas Company to the Semet-Solvay Company, of Syracuse (N.Y.), has expired, and that the former Company are thereby restored to their early position of exploiting bye-products coke-ovens of the Otto-Hoffmann and United-Otto types. It is stated that there are a great number of these ovens—about 2600 in the United States and Canada—now in operation or contracted for; so that the recovery of bye-products in the manufacture of coke appears to be now permanently established. Among the Directors of the Company are Mr. S. E. Barrett, Mr. Emerson M'Millin, and Dr. F. Schniewind. The last-named gentleman, who, it may be remembered, read a paper in the Gas Section of the International Engineering Congress in Glasgow, in 1901, on "The Production of Illuminating Gas from Coke-Ovens," is Vice-President.

Stiffening a Large Water-Tank.—The Rochester and Lake Ontario Water Company have a large stand-pipe or tank on a hill overlooking the city of Rochester. It is 150 feet in diameter and 20 feet high. The bottom is formed of $\frac{3}{8}$-inch wrought-iron plates connected to the lowest course of side plates by a 4 in. by 4 in. by $\frac{3}{4}$ in. angle. The side plates are respectively $\frac{3}{8}$, 9-16ths, 7-16ths, and $\frac{3}{8}$ inch thick. The tank is braced by 24 vertical trusses connected at the top by a horizontal lattice girder, the inner chord of which is a 4 in. by 4 in. by $\frac{1}{2}$ in. angle, and the other a $3\frac{1}{2}$ in. by $2\frac{1}{2}$ in. by $\frac{1}{4}$ in. angle—the girder being 18 inches wide. It has a double system of $1\frac{3}{4}$ in. by a $\frac{1}{4}$ in. lattice bars. This girder prevents the top of the tank from collapsing, and transfers the wind load to the vertical trusses. These are designed to act as cantilever beams; the load being applied at the top through the horizontal girder, and below that point by means of the shell of the tank, to which the trusses are rigidly riveted. The outer end of each vertical truss is anchored to a masonry pier by a $1\frac{3}{4}$-inch bolt. The maximum wind pressure considered was 30 lbs. per square foot on the convex surface of the tank.

YORKSHIRE JUNIOR GAS ASSOCIATION.

The Naphthalene Question.

The members of the Yorkshire Junior Gas Association on Saturday gathered at the Municipal Technical College, Bradford—the PRESIDENT (Mr. W. Cranfield) in the chair—to resume the discussion on "Naphthalene," upon which they had been engaged at their December meeting. On that occasion, Mr. J. H. Brearley, of Longwood, introduced the discussion (Vol. LXXXVIII., p. 911); while on Saturday it was re-opened by Mr. J. F. SMITH, of Halifax, whose paper appears below. Striking evidence of the interest taken both in the subject and the meeting was afforded by the presence of members from places as far distant as Redcar and Hull.

NAPHTHALENE.

Bowditch, in his "Analysis and Use of Coal Gas," published in 1867, says that there could be no more mistaken practice than to cool coal gas to a temperature bearing some approximation to the surrounding atmosphere; and that it is in the power of most gas engineers to make a considerable difference in the illuminating power of all the gas they manufacture by the adoption of a better mode of condensation. The proper object of condensation, he says, is the removal from the gas of substances produced in the distillation, which for some reason are not useful for the purpose of illumination or cannot be distributed; but all the substances which are useful as illuminants, and can be distributed with the gas, should be retained. In order to accomplish this, the hydraulic main should be kept hot, and the gas and vapours passing from this should be directed to a separate apparatus, kept at a regulated temperature, in which the gas and the light hydrocarbons might be separated from the heavier bodies before passing to the purifying apparatus, so that a larger proportion of the hydrocarbon vapours could be distributed with the gas. This method of condensation, he suggests, would probably tend to lessen the deposition of naphthalene in the gas-mains, which now (in 1867) causes so much trouble, as the deposition cannot take place in the presence of a considerable quantity of hydrocarbon vapours, and in another way the heavier compounds which form tar have a strong affinity for naphthalene at high temperatures, and as they condense they are apt to carry down the naphthalene with them, and so much of it would be carried down with the heavier compounds that the vapours of the lighter oils would be able to uphold the remainder. Thus stoppages of mains would become a very rare thing, if not unknown.

After the gas has been through the hot condenser, Bowditch suggests that it should pass through another condenser, the outlet of which should be kept at as high a temperature as possible in accordance with efficient purification. Though he does not mention the temperature, it is evident that he considers 90° Fahr. or over about the proper one to use. There is no doubt that fractional condensation in connection with coal gas is worthy of further study. But the method laid down by Bowditch requires very careful looking into before adopting it in practice; for there is a weak point which, if not remedied before it is applied, would lead to disappointing results. This weak point is keeping the hydraulic main hot. He has unfortunately not stated the temperature at which this should be kept; but it is evident from what he says in his lecture that about 400° Fahr. would be the one chosen, for he remarks that the lighter hydrocarbon vapours would not be absorbed at this temperature.

If the hydraulic main be kept at this heat, a large amount of naphthalene would be carried to, and through, the special fractionating apparatus, by the steam from the ammoniacal liquor, which would be present in the gas at this stage. This can be easily shown by a simple experiment. If tar containing naphthalene and water be placed in a retort connected to a condenser, and heated, it will be noticed that a large quantity of naphthalene with a small quantity of oil comes over with the steam. The oil will be about saturated with naphthalene; while the excess of this substance will be deposited in the condenser tube in the solid form. From this it will be seen that, if the hydraulic main is kept hot, naphthalene along with the oils will be carried forward by the steam contained in the gas; while in the special separating apparatus there would be a mixture of naphthalene, oils, and water vapour, so that it would be expected that a large quantity of naphthalene and the lighter oils would be carried forward to the cooling apparatus proper. In this there would be a further deposition of these substances; but at the outlet the gas would be saturated with moisture and naphthalene, while the light hydrocarbons in the gas would be less than would be expected, owing to the absorption of some of them by the heavier hydrocarbons and solid naphthalene, which would be deposited in the last cooler or condenser, though the temperature of the outlet of this may be kept at 90° Fahr. or thereabouts. The gas leaving such an apparatus would gradually cool as it passed through the mains to the washing and scrubbing plant, so that moisture and naphthalene would be deposited in quantity, and would in time have to be dealt with.

INFLUENCE OF WATER VAPOUR.

If fractional condensation is to be used in the manufacture of coal gas or any other gas in which large quantities of naphthalene

and water are produced, care will have to be taken to remove as much water as possible at an early stage, so as to get rid of this carrying action of steam. It may be mentioned that the carrying power of steam is due to the fact that tar and water are non-miscible; and when two such substances are heated to boiling point, it is found that this temperature is lower than either constituent of the mixture, and is due to the vapour pressure of the mixture being equal to the sum of the vapour pressures of the substances. This same physical fact is taken advantage of in some chemical industries for distilling substances that cannot be heated to their boiling point, without decomposition, and is known as "steam distillation." Some time ago, this was very forcibly brought to the writer's notice when carrying out some experiments on the absorption of naphthalene by washing with creosote oils, which were undertaken in order to ascertain whether a fact well known in physical chemistry could be applied to this process, and which may be stated as follows: "When the temperature of a solvent is raised above the melting point of the substance to be dissolved, the substances are miscible in all proportions." It was thought that by keeping the temperature of the heavier or creosote oils at about 82° C., the maximum amount of naphthalene would be absorbed, and at the same time the loss of illuminating power due to the absorbent power of these oils for the hydrocarbon vapours would be overcome without the use of benzol, as was proposed by Messrs. Leather and Irwin. On carrying out the experiment, it was seen that water, and then naphthalene, condensed from the gas passing from the absorbing apparatus, though the creosote oil was not saturated with naphthalene. On examination of the creosote oil, it was found to contain 3 per cent. of water, which apparently caused the trouble. The same thing can frequently be observed in the fractional distillation of tar which contains quantities of naphthalene and high percentages of water when, during the first part of the distillation, naphthalene will condense on the beak of the retort.

SUGGESTIONS ON CONDENSATION.

The fractional condensation of coal gas seems to be best carried out by separating, as soon as practicable, as much as possible of the heavier tar fog and ammoniacal liquor by means of the cyclone or other separating apparatus, and keeping up the temperature of the first portion of the condensers to such a point as will allow the condensing hydrocarbons the full play of their absorbing power without increasing the amount of the naphthalene because of the water vapour present. Such a process could be rendered more valuable by increasing the amount of the lighter tars which will condense at the cold end of the condenser, by introducing them free from water at the warm end, and so increasing such light hydrocarbons in the condensing system as would be useful for illuminants, and easily carried by the gas.

Dr. Colman's system of condensation has practically the same end in view as that of Bowditch, though in his process the trouble caused by the water is greatly diminished by separation of the heavier tar fog and liquor from the gas before it reaches the condenser. This increases the vapour pressure of the lighter hydrocarbons, and allows them to exert their solvent action more fully on the naphthalene present, while they are being liquefied and falling through the gas in the cooler parts of the condenser, and at the same time increases the light hydrocarbons at the outlet end of the condensers. In order to get the fullest amount of usefulness out of the lighter tar that is thrown down in the condensers, it is run back against the stream of gas; and in order to still further free the gas from naphthalene, where the amount of light oils is not sufficient to effect its removal, it would be well to revolatize in a simple manner the lower boiling portions from the previously separated tars. It will be seen that in this process the aim is first to remove the substances that cause the lowering of the vapour tension of the useful constituents, so that they may have fuller play of their solvent action, and increase their vapour tension in the outlet gas, which will contain an additional amount of the illuminating hydrocarbons; and, further, where lighter fractions are insufficient, they are increased from the condensed tars by evaporation, so that their molecular percentage is increased in the condensing system. As a result of this, the amount present in the gas at the outlet of the condenser will be increased. This can be done in other ways, though it is not intended to enter into them at present, but only to point out that water vapour, as found in quantities generally present in the crude gas, cannot be disregarded if such a process of condensation as that proposed by Bowditch is to be employed.

WASHING GAS FOR NAPHTHALENE.

The use of solvents to effect the washing of gas in bulk on the works is gradually becoming more general; but the several methods that are being adopted are practically the same in principle—namely, bringing into contact with the gas a solvent for naphthalene to reduce the quantity present in the gas at the outlet of the apparatus, in order that there should not be any likelihood of deposits being formed in the mains while the gas is being distributed. The most important point in the process is to select a solvent that has a good affinity for naphthalene, and one that does not reduce the illuminating power of the gas by the washing process. At the same time it should not be too volatile. While the solvent is removing the naphthalene, it is also dissolving other hydrocarbons from the gas, so that the vapour tension of the solvent is gradually altering as the gas is passed through it.

It appears that a solvent having a slightly higher vapour tension than would correspond to the amount of hydrocarbons present in the gas would be the one to use; for if the gas were saturated with naphthalene, the vapour tension of the solvent would gradually be lowered until it would not give the necessary vapour tension when the amount of naphthalene it would usefully absorb had been taken up. So that, before choosing a solvent, it is necessary to obtain some data as to the amount of naphthalene and condensable hydrocarbons, and their illuminating value, at the inlet and outlet of the washing apparatus for different amounts of solvents, and quantity of naphthalene taken up.

CLEAN GAS AND FOULED MAINS.

All the solvents that have been proposed for the above process will take up naphthalene, and reduce the amount of this substance in the gas to a harmless quantity, if properly selected and applied; but it should be remembered that this does not mean that they will in a very short time reduce the number of naphthalene complaints to *nil*. In many cases where the processes will be brought into use, the mains and services contain very large quantities of this substance; and complaints will still have to be dealt with until this has been removed (so that it cannot re-saturate the gas and cause further trouble) although the gas may be free from naphthalene on the works.

It has already been explained in one of our discussions that the amount of naphthalene in the gas leaving the condensers depends on the quantity of that and other substances in the gas at the inlet; and that which is picked up in the mains and apparatus on the works and district depends on the vapour pressure of naphthalene pure and simple. The principles that govern the process of condensation to a very large extent govern those of the washing processes, and can be applied to these; for in them the substances are first absorbed and afterwards evaporated. But if this is to be done, it must be remembered that the molecular percentage of the fraction to which the solvent belongs has been increased. It is not absolutely necessary for the gas to be saturated with naphthalene when it leaves the condensers to deposit this substance in the mains, &c., inside the works. This will be readily seen when it is remembered that in removing impurities by the ordinary purifying processes, the volume of the gas is reduced not only by their removal, but also by the removal of the moisture above that which the reduced volume will carry. The sum of these in most cases amounts to several per cents., so that deposits are often found at the outlet of the clean water washer and inside fouled purifiers. In some instances deposits have been discovered in the gasholders. The writer has seen several pounds of the substance thrown over the side of a gasholder tank where a holder has been allowed to become too full and blow.

In a case of this description, relief from naphthalene could hardly be expected for some time by the removal of the naphthalene from the gas by washing with oils, or by an improved method of condensation; for when the gas came into contact with the naphthalene in the holder, it would become more or less saturated according to the length of time it was allowed to remain in it. Even if the gas had not time to become fully saturated at this point, it would gradually become so on its passage through the mains, which contain quantities of solid naphthalene. The writer remembers making some experiments in which it was found that the gas going to the holders contained about 3 grains of naphthalene per 100 cubic feet; but during the night, and at the same time as the test was going on, there were a number of lamp services made up. It can hardly be said that this amount was capable of depositing and making up the services; for it would require a much lower temperature than was recorded by the minimum thermometer during the time the test was being taken. The trouble must have been owing to the gas becoming saturated in its passage through the holder and the distributing mains, and then being brought into the cooler services of the lamps where the deposits were found.

In testing on the works a process for the removal of naphthalene from the gas, it will be necessary to try it over a long period, so that the naphthalene in the various parts of the plant and distributing system may be got rid of by saturating the gas with it and removing the deposits when they cause inconvenience, or to first clean out all the mains, &c.—an operation which would be impracticable except on the very smallest works and districts. It is therefore necessary to be very cautious in adopting new processes for the removal of this substance on the works; for if a number are tried one after the other until at last (judging from the number of complaints) one appears to be doing good, we may be led to think that it is all due to the system in use when the complaints begin to fall off, when really the credit should have been divided—perhaps unequally—among all the processes tried, and not the last one alone. All the methods of dealing with the substance that have been proposed may or may not have the same value; but the method of changing from one to another and judging by the number of complaints alone, should not be employed, unless it is proved beyond doubt that the fault lies in the method of treatment and the materials used, by tests of the gas before and after treatment, so that the unknown factor—*i.e.*, the effects of the naphthalene in the mains, &c.—shall not enter into the calculations, but only the cost, efficiency, and adaptability. The rest is only a matter of time, patience, and perseverance.

The method of clearing the mains and services, as well as the plant about the works, will vary according to the position in which they occur. If stoppages occur where there are blank

flanges or handholes, the best thing would be to scrape out the deposit and thus completely remove it. In places where this cannot be done, it is advisable to use a solvent which can be readily removed from the pipes, &c. If the places where the deposits occur are before the purifiers, a crude solvent, such as crude naphtha or light oils, can be used; but if these occur after the purifiers, crude products should not be employed, as they may contain some ammoniacal liquor which cannot be separated, and when poured into the mains, &c., through which a current of gas was passing, sulphuretted hydrogen would be given off, and would foul the gas in the holders, if a quantity of these products had been used.

BENZOL ENRICHMENT AND NAPHTHALENE TROUBLES.

Various methods of clearing street-mains of this substance have been proposed. One, of which a great deal has been heard, is carburetting the gas at the works by means of benzol or carburine, &c., which is said to serve the double purpose of enriching the gas and preventing naphthalene deposits. While the writer admits that the candle power of a gas can be increased by this method, he doubts whether, by its adoption alone in a district troubled with the deposition of naphthalene, much relief would be found, except after a very long period; for in this case gas containing something short of its full quantity of naphthalene would be turned into the mains, which contain deposits of this substance, and would in time become saturated with it, so that on the lowering of the temperature some fresh deposit would be formed, but at a greater distance from the works. If benzol or other enriching or non-enriching oils could be used in very large quantities, so that when the temperature decreased there would be a fog of these substances formed in the gas-mains, then some naphthalene would be dissolved out of the gas; but while the particles of the oily vapour grew larger, and presented a greater surface to the gas, they would also become heavier, and fall to the bottom of the pipe, when the absorbent power of the oils would not exert its full power on the gas.

Experiments made by the writer show that the solvent will only be about half saturated with naphthalene during this process, when dealing with a gas saturated with naphthalene. The saturation of gas by vapours of hydrocarbons having high vapour tensions would, of course, be impracticable on the manufacturing scale for a town's supply, on account of the cost and for other reasons; but oils of fairly low vapour tensions can be employed because of their easy recovery and preparation for use again. The tension of these should not, however, be lower than that of naphthalene. The carburetting of gas to increase the illuminating power one or two candles would not help very much to decrease naphthalene complaints on the district, though the oils having the highest vapour tensions would assist more than those having lower ones.

It has been said that a tenth of a gallon of benzol will increase the illuminating power of 1000 cubic feet of gas a candle. From this we can calculate the increased carrying power of the gas for naphthalene due to this source. A gallon of benzol, having a specific gravity of ·880, would weigh 8·80 lbs.; so that a tenth of a gallon would weigh 0·88 lb., or 0·88 × 7000 = 6160 grains. And as a cubic foot of benzol vapour weighs, at 60° Fahr. and 30 inches pressure, $\frac{78}{2} \times 37{\cdot}15 = 1448{\cdot}85$ grains, then 6160 grains of benzol would occupy when it was in the state of vapour 6160 ÷ 1448·85 = 4·25 cubic feet, which would raise the 1000 cubic feet to 1004·25 feet, or an increase of 0·425 per cent. by volume.

As the picking up and carrying of naphthalene in the mains obeys the simple law of vapour tensions, so long as the composition of the gas passing through them remains constant, we can easily calculate, by simple proportion, the difference this increase of volume will make. According to Allen's investigation, 100 cubic feet of gas will require 21·66 grains of naphthalene to saturate it at 60° Fahr., so that 100·425 × 21·66 ÷ 100 = 21·752 grains would be carried by 100·425 cubic feet. From this it will be seen that the carrying power of the gas is only increased by 21·752 − 21·66 = 0·092 grain per 100 cubic feet (or less than a grain) for each tenth of a gallon of benzol added—a result which shows that it would take a long time to wear down the naphthalene deposits if no other means were taken to remove it.

Discussion.

Mr. J. H. Hill (York) had not found quite the time he should have liked to prepare himself for the discussion; but this was partly because, fortunately, naphthalene had not been obtruding itself upon his attention. He noticed that the paper had made no mention of the action of friction on the gas in facilitating naphthalene deposits. What was the explanation of such action? Did it produce a lowering of the vapour tension? At York, such stoppages as they had invariably occurred at the places where they had rising ground, though these elevations seldom amounted to more than 40 feet. Could Mr. Smith give any information as to the nature of "gasene" recently quoted as having had so striking a success at Milan, and now on the English market? He quite approved of the emphasis laid in the paper on the important influence of the water vapour in the gas, and recalled the expedient formerly advocated of desiccating the gas. As that process had never been widely adopted, and had now fallen into entire desuetude, he presumed it had, nevertheless, not been a success. Carburetted water gas had frequently been quoted as having an effect on naphthalene troubles. Their experience at York led them to think that at least up to 20 per cent. of it in the mixture had a decidedly beneficial result.

Mr. P. Parrish (Dewsbury) expressed some doubt as to the reliability of the Colman and Smith test for gas naphthalene. Had Mr. Smith ever had benzene picrate deposited? He had been passing gas through wash-bottles containing benzol and toluol. He found he could remove all the naphthalene this way, and could easily then ascertain the amount in the solutions; and the results were very reliable.

Mr. H. Roberts (Drighlington) referred to the recent paper by Mr. Everitt, of Ilkley, on the subject of screens for the removal of tar fog, and asked how they were likely to bear on the question of naphthalene treatment.

Mr. W. N. Booth (Halifax), in referring to Mr. Hill's query about the influence of friction, thought much light was thrown on the subject by the investigation of the power of steam to carry minute particles of condensed water along with it. It could do this up to 15 per cent. of its weight. Any obstacle put in the path of the steam precipitated most of this water. Similarly, he thought that excessively fine crystals of naphthalene could be carried by the gas; and these would certainly be brought down if the free passage of the gas was obstructed. As to the effect on naphthalene troubles of from 15 to 20 per cent. of carburetted water gas, this all depended on how the water gas was carburetted. His experience was that, using the same oil, one could make as much naphthalene as ever could be found in coal gas, or a naphthalene-free gas could be sent out.

Mr. C. Roper (Bradford) said that very little trouble was experienced in Bradford, either on any of the works or in the district; and their Distributing Superintendent was inclined to attribute this to the fact that their mains were so well interconnected, and that there were but few dead-ends. As the gas was delivered from different works in different proportions, &c., and as the areas supplied from each were all coupled up, the gas in certain parts would also vary in its direction through the pipes from time to time. In one case, a 9-inch main was laid along a certain road, and stopping when it reached a stream. In the vicinity of the dead-end thereby formed, naphthalene deposits were very troublesome. Since, by a re-arrangement of the pipes, this main had been converted into a through main, no further trouble had been experienced.

Mr. F. Scholefield (Dewsbury) asked for information as to why different coals carbonized under the same conditions should give such widely varying amounts of naphthalene, seeing that no naphthalene as such existed in the coals.

The President referred to Mr. Smith's experiment of absorbing naphthalene in hot creosote oil, and asked if he had repeated this with the oil free from water, and, if so, with what result. He threw out the suggestion that in naphthalene saturated gas meeting with a sudden increase in friction, they might have a similar state of affairs to the well-known examples of supersaturation in liquids, where a solution might be cooled some way below the point at which it ought to deposit crystals without any such crystals settling out, while a sudden jerk or the dropping in of a crystal would then produce a sudden accomplishment of the delayed crystallization. In the case of gas heavily carburetted with benzol, at special periods when a sudden fall in temperature was expected, it had been stated that much relief was experienced in the prevention of lamp stoppages. Might not this possibly result from the benzol condensing out in the lamp, trickling down, and then dissolving enough naphthalene from an obstruction just about to close up the bottom part of the pipe, to ensure for the time a sufficient gas passage? He had expected to have heard more comment upon the heresy of a condenser outlet at 90° Fahr. [Mr. Smith: "That is Bowditch's advice, not mine."] The paper was an invaluable one, and one that demanded close subsequent examination and study, rather than lent itself to an immediate discussion. It was one characteristic of Mr. Smith's work, in its timely and convincing referring back of gas-works problems to the known laws of science.

Mr. Smith, in replying to the discussion and questions, expressed his agreement with what Mr. Booth had stated about the action of friction on naphthalene laden gas. He hardly thought there was a proved state of gaseous supersaturation, though when a deposit of naphthalene round a roughness in a pipe was examined, it was usually found that there was a distinct crystal that had just formed, and that this had apparently helped to secure the further deposition around it. Napthalene was usually considered to pass from the solid direct to the gaseous form, and *vice versa*, in the gas-mains, without any intermediate liquid state. Personally, he thought the liquid state did intervene, though he was not aware of any definite proof of this. If it was the case, this brief condition was probably the critical stage in the interaction between the condensation of water and the consequent settling out of naphthalene. In opening up a 50 feet length of main which was blocked, he found water condensing out at a distance of 10 feet from the inlet end, and naphthalene 5 feet further on. In the condensation of this water vapour, latent heat was given out. This would cause just enough rise in temperature to carry the naphthalene a little further, until more cooling brought it down. When one sharp bend quickly followed another, he had generally found water in the first bend and naphthalene in the second. He was glad to hear Mr. Hill remind them of the old experiments in the way of drying the gas. Any lessening of the amount of water vapour was advantageous, not only because of

the carrying action of the water on naphthalene, but because of its directing influence on its deposition. He had seen attempts made to dry gas with quicklime after the ordinary purification, with more startling results on the purifier-grids than on the gas. It was of no use attempting to dry gas which was then to be stored over water in a holder. It was also to be borne in mind that if gas saturated with naphthalene deposited water, its volume was decreased, and as it then could not continue to hold all its naphthalene in suspension some must be deposited. He had known screens placed in the hydraulic main get so blocked with tar that the gas could scarcely force its way through, and excessive back-pressure resulted. Mr. Everitt had suggested his screens for dealing with tar-fog, and not for naphthalene removal. In fact, he (the speaker) doubted their utility in this latter respect, inasmuch as water vapour would constantly beat on any naphthalene there deposited and carry it forward, as he had fully described in his paper—and the more so because it would be in a finely divided form. He had never had the opportunity of handling any "gasene," and could say nothing definite about it. Carburetted water gas would undoubtedly assist in dealing with naphthalene, if properly made; but the oil must not be over-cracked (1250° Fahr., and not higher). A convenient collateral indication was afforded in the amount of emulsion that showed on the surface of the tar. Much naphthalene in the gas was usually accompanied by plenty of this. He referred Mr. Parrish to the recently published investigations of two American chemists who had been examining the Colman and Smith test for some months lately, and who were satisfied with its reliability. Benzene picrate was soluble in water, as were also all the picrates, except that of naphthalene. They were insoluble in alcohol; and Mr. Parrish would get his precipitate of benzene picrate if he employed an alcoholic solution. Had he done so? [Mr. PARRISH admitted that he had; and said this was plainly the explanation.] As regarded the creosote oil experiment, he repeated it afterwards with dry gas and dry oil, and found no carrying over of the naphthalene. If any benzol did condense in lamps, as had been suggested, it would carry naphthalene with it to the main. The benzol would then evaporate at a very much greater rate than the naphthalene, which would be left in a solid and coherent mass, ready to help form a serious block there, and able to give off vapour to assist in re-saturating later gas preparatory to other blockages. When naphthalene settled out, it did not very seriously affect the candle power of the gas; but washing did, especially if creosote oil was used. As regarded the apparent difference of coals in their naphthalene yield, he thought it was all a matter of how they made the gas. The great principle was to avoid keeping the rich gases in the retort any longer than could be helped; otherwise they were decomposed and naphthalene produced. Hence for rich gases a good pull on the retort was advisable—adjusted from time to time according to the portion of the carbonization period and the consequent quality of the yield of gas. In other words, a varying pull, governed by the watching of a jet in the engine-room, and so varied as to keep the jet at a constant height, would help materially in keeping down naphthalene formation and in securing the best results from the carbonization of the coals used.

The meeting closed with hearty votes of thanks to Mr. Smith.

Conveyance of Tar and Liquor by Rail.—At the meeting of the Nottingham Section of the Society of Chemical Industry at Derby on the 25th ult., the first paper was by Mr. F. J. R. Carulla, "On Tanks for Carrying Tar and Gas Liquor by Rail." The author proposed the introduction of iron strips that could be easily replaced, to take up the wear that is now undergone by the tank itself wherever wood and iron come together. When the tank is travelling, abrasion is constantly going on between the two surfaces, and after a certain time the plates wear out. A discussion followed, in the course of which Mr. Kempson detailed a form of setting for flat tanks which they had found satisfactory. At each end of the tank a strong baulk is placed on edge, extending from one side to the other of the waggon frame, and the two are securely fastened thereto. The frame with these baulks across it forms a cradle to hold the tank in its place, and with the tie-rods of proper strength there is very little of the wear referred to in the paper.

Apparatus for Thawing Pipes.—We learn from the "Engineering Record" that the Pittsburg Transformer Company, of Pittsburg (Pa.), have been manufacturing a "pipe thawer" outfit. It weighs only 235 lbs., and with its application water will usually begin to flow in five or ten minutes, slowly at first, and increasing to the normal volume as the ice is melted or washed away in small fragments. The outfit consists of a transformer adapted to operate on any circuit of approximately 1100 or 2200 volts and 60 or 133 cycles. The transformer will deliver a current of 300 amperes continuously, or currents of about 600 amperes for periods of half-an-hour. On the back of the transformer are mounted a heat indicator and a choke coil. The former consists of a section of lead pipe, connected in series with the transformer, and the temperature which this assumes is a guide as to the heating of the pipe under treatment. The choke coil consists of a few turns of heavy copper bar, with a movable laminated iron core. When this plunger is pushed entirely into the coil, the transformer secondary may be short-circuited, but no more than normal current will flow. One secondary lead is connected to the pipe inside the house, and the other to a neighbouring house.

JUNIOR INSTITUTION OF ENGINEERS.

Celebrating their "Coming of Age"—Mr. Balfour Browne on Science and Experience and the Law.

The Junior Institution of Engineers was founded in 1884; consequently this year it has attained its majority. The 21 years have been a period of steady and successful effort; and in membership and technical record, the Institution can claim rank second in place to the premier Institutions. For the members, the work has been valuable and stimulating; and there are few who have joined the organization who have not been glad, for old associations' sake and for the benefits they still are able to derive from it, to continue their membership. Twenty-one years upon the lives of the first members bring them well to that stage which must be regarded as "middle life;" and to take stock of the personal appearance of some of the "juniors," though they continue to claim membership in the Institution, their right to profess and call themselves by their old name could easily be refuted. The fact is the older members, not less—but perhaps rather more so—than the younger ones are proud of their Institution, and so of their membership.

But this year the Institution have "come of age;" and, as in family life, such an occasion is one for rejoicing. The year is to be marked by special events; and last Saturday evening saw the first. It was called the "Coming of Age" Dinner, and was held at the Hotel Cecil. The President (Mr. W. H. Lindley, M.Inst. C.E., F.G.S., of Frankfort) was in the chair; and Mr. Samuel Cutler, jun., the Chairman of the Institution, occupied the vice-chair. At the upper table, eminence was in grand force. On the right of the President was Lord Reay, and on the left the Ven. Archdeacon Sinclair, D.D. Next to Lord Reay was seated Mr. J. H. Balfour Browne, K.C.; and near by sat Professor Ewing, Dr. R. T. Glazebrook, Professor Ayrton, Mr. Charles Hawksley, Mr. James Swinburne, Mr. Alex. Siemens, Mr. D. Irving (President of the Institution of Gas Engineers), Mr. Samuel Cutler, sen., Professor Armstrong, Mr. J. W. Bradley—in fact, all the Senior Institutions were strongly represented at this celebration. Dinner having been served, there was a long list of toasts; the speeches being interspersed with music, songs, and other entertainment. Perhaps one criticism is permissible. It is a pity that the toast of the evening—"The Junior Institution of Engineers"—should have been placed almost towards the end of the list, which made the hour late before it was reached, and no doubt prevented the relation by Mr. Samuel Cutler, jun., in responding to it, of much that would have been specially appropriate to the commemoration. However, after the loyalty of the gathering had been expressed, the first toast was "Legislation and Engineering." It was proposed by Professor Ayrton, and responded to by Mr. James Swinburne and Mr. Balfour Browne. The two engineers were in bantering mood; and, not being in the witness-box, the short-comings (as they saw them) of the Legislature and of the learned gentlemen at the Bar were subject to their cutting humour, which at times (as Mr. Balfour Browne said later) was "scarcely complimentary" to him.

"The right of reply," however, was with Mr. Balfour Browne; he being the second to respond. With his usual adroitness, he turned the laugh on to those who had made the attack; adding that he was sorry to say, in speaking to the toast (which he was going to take seriously), the two engineers had been a "little flippant." The toast, in his opinion, should have been "Engineering and Legislation." He placed engineering before legislation, because he always knew that science and experience must go before law. Legislation was sure to go wrong unless it followed closely in the footprints of experience and science. Among his illustrations of the point, he said that the Legislature had at one time a strong idea that competition between gas companies would make the companies do their duty to the public. It was very soon found out that this was entirely a mistake. Engineers saw that the companies who were in competition were doing injury to themselves, and no benefit to the public. To compete, they had to make two capitals do the work of one; and they had to break up the streets and roads in a manner that was quite unnecessary. They promoted a Bill in Parliament for the districting of London between the gas companies, and to submit them to the regulations of Parliament. What was the result? Parliament, still clinging to its old idea of competition, rejected the Bill. Then the engineers themselves set to work to divide London into districts—the districts that existed to-day; and a few years afterwards, Parliament had to eat its own words, and do what they had refused to do a few years before. Again, gas and water companies had from time to time been expropriated in the interests of the public. Parliament saw that they got large sums of money when they were expropriated. He did not believe they got more than they were worth. So Parliament said, when electricity undertakings came along, "We will pass an Act, and take away the benefits which these financiers get." They passed the Electric Lighting Act of 1882, and enacted that the promoters should sell their undertakings at the end of 21 years, at old-iron value, without any goodwill. Parliament was not wise enough; and the financiers were certainly wiser than Parliament. For some years, as the result, absolutely nothing whatever was done with regard to electric lighting in this country; and in 1888, an Act was passed which gave the promoters 42 years in which to recoup themselves. This Act was in operation to-day. It

seemed to him that there was now absolutely nothing free except trade, and that would not be for long. (Laughter.) When he saw what Parliament was doing, he could not help thinking that the prelude to the prayer of the old Scotch minister was appropriate: "Now, my brethren, let us pray that the High Court of Parliament will not do us harm." [Learned Counsel put it in the vernacular; we content ourselves with the interpretation.] There was, he continued, an appropriateness in coupling together engineering and legislation. Notwithstanding the travesty they had had from Mr. Swinburne, no great engineering work had been carried out without the assistance of Parliament. Mr. Swinburne thought it was a small matter to break up the streets and roads. But no great supply of gas or water in this country could have been carried out unless Parliament intervened to give promoters power to break up streets. He (Mr. Balfour Browne) had been brought into genial intercourse with members of the engineering profession; and, "except on festive occasions" (laughter), he had found them able, intelligent, helpful. One great thing he had always found was that engineers knew what they wanted. As for Parliament, it never knew what it wanted; and it would not be happy until it got it. Mr. Balfour Browne's final words were: "As for the backbone of Parliament, you may seek for it a long time in the flabby opportunism of that great assembly."

There were several other toasts—"The City and Port of London," "Municipal Engineering Progress," and "Applied Science." The toast of "The Senior Institutions" was proposed by Mr. Sidney H. Wells, who could claim to be one of three members present having the longest connection with the Junior Institution; and therefore he knew how much they were indebted to the aid and the support of the Senior Institutions. For the influences which had helped to make the Junior Institution, for the forces which had given it prestige and power, he could say, with all sincerity, that they owed most to the Senior Institutions, whom they desired to honour. They had had the honour of being able to claim as Presidents men who had held high positions as Presidents of these great Institutions; and he thought he was right in saying that one or two of these had not attained to that eminence until they had been Presidents of the Junior Institution. So that the debt was not wholly on one side. Mr. Charles Hawksley, in responding, mentioned that the Junior Institution had almost double the membership that the Institution of Civil Engineers had when they attained the age of 21 years. Mr. Alex. Siemens, the President of the Institution of Electrical Engineers, also replied. The toast of the evening—"The Junior Institution of Engineers"—was proposed by Lord Reay, who regarded it as a great honour on this memorable occasion to be entrusted with the toast. His remarks were pregnant with encouragement. Mr. Samuel Cutler, jun., in replying, voiced the members' appreciation of the encouraging observations made by the distinguished proposer of the toast. Owing to the lateness of the hour, his remarks had to be limited. But before concluding them, he took the opportunity of saying that the year marked the majority of the Institution; and this assembly and dinner was the brilliant opening function of a series of events with which they proposed to celebrate their "Coming of Age." He should like to pay a tribute to those gentlemen who had done so much to secure the position which the Institution occupied that day. He referred to the Past-Presidents and present President. Without their advice, co-operation, and assistance, the Institution would not be in its present position.

With "Auld Lang Syne" and the "National Anthem," the company separated, after an evening of great enjoyment.

SCOTTISH JUNIOR GAS ASSOCIATION.

Western District.

A Meeting of the Scottish Junior Gas Association, Western District, was held in the Technical College, Glasgow, on Saturday evening, and was attended by between seventy and eighty members. Mr. James Lowe, the President, occupied the chair.

COAL CONVEYING AND HANDLING PLANT.

Mr. I. Webster, the Manager of the Provan Gas-Works of the Glasgow Corporation, read a paper on the above subject. Apologizing for having had so little time for preparing his paper, he said he intended to give only a description of the coal and coke handling plant in use at the Provan works, as the various types of conveyor were too numerous to describe in a short paper. At Provan, they were very fortunately situated for the economical handling of coke and coal, as the coal was brought in at a high level, and the coke was sent out at a lower one; there being railway connections to both levels. The coal was all put into their sidings on the high level. On arriving at the works, it was weighed, then run along the high-level platform in the coal-store, and tipped into storage hoppers by a hydraulic tipping-machine. The rails in the coal-store were so arranged that the full waggons went in by one road, and the empty ones went out by another. Hydraulic capstans had been installed for placing the full waggons on the tipping-machines, and withdrawing the empties. The cost at present for weighing, emptying, and taring the waggons came to 0·563d. per ton of coal. This cost was calculated for 460 tons per 24 hours; but he hoped to reduce it as more work went on, and the full efficiency of the plant was utilized. The coal was fed from the storage hopper (to which there was being attached an automatic feeder) into two coal-breakers. It was then elevated to other storage hoppers, for feeding the charging machines. The elevating plant consisted of two ordinary bucket elevators, driven by a hydraulic motor placed on the top level. The main conveyor was of the Babcock and Wilcox gravity-bucket pattern, and was used as both conveyor and elevator. The conveyor consisted of two double-link chains, made of flat steel, with steel stud rivet distance-pieces for the pairs of links. The chain carried buckets, made of mild steel, stamped out of one sheet, and having each a pair of combined cams and trunnion bearings riveted on. Each bucket held 83 lbs. of coal. Between the buckets was a cross stay, which formed also an axle for carrying two small wheels, which ran on what was practically a light railway when the conveyor was going horizontally. When changing direction from horizontal to vertical, two large guide-wheels were used, which were free to move; thus reducing the friction at this point by forming a revolving instead of a fixed track. The filling arrangement, which formed an important part in all forms of gravity-bucket conveyors, consisted of a series of seven hoods, with openings corresponding to the pitch of the buckets, delivering certain quantities of coal into them. The filler chain was driven direct by the conveyor chain, thus ensuring regularity. The tipping was effected by a pair of cams, carried by a cross shaft, coming into contact with the cams riveted on to the ends of the buckets. The cross shaft carrying the cams was worked by a lever, set and fastened either to pass the buckets or to tip them as required. The chain moved very slowly, at the rate of about 14 buckets, or a little over 32 feet, per minute. The coal, after leaving (say) No. 1 breaker, went through the filler into the buckets, and was conveyed to the central hopper, where it was tipped. The conveyor then proceeded to No. 2 breaker and filler, received another supply of coal, and tipped it into the hopper at the top end of the retort-house; thus taking two supplies at the one cycle. The conveyors were erected to deal with 600 tons of coal per 24 hours. The coal was taken from the overhead hoppers to the charging-machines, which were of Arrol-Foulis type. Four of them worked 60 ovens of 12 retorts, or 672 mouthpieces. The coke was drawn by machines of the same type, and fell down shoots into either side-tipping or hopper bogies. The hopper bogies were then drawn by small locomotives up to the level for feeding the producers, and the side-tipping ones to the quenching-house. After being quenched, the coke was emptied into hoppers, and automatically fed into conveyors, which, starting below ground, rose and passed along an elevated gantry with coke-riddles fixed at the end. The conveyor was in duplicate; and the filling arrangement for it was similar to the coal-conveyor, and so arranged that the coke could be tipped at any part of its length for storage purposes, or conveyed to the riddles, which automatically sorted it into breeze, riddled breeze, and coke, and delivered it into waggons. The coke could also be loaded into waggons unriddled. The material was never touched by a shovel from the time it came in as coal till it went out as coke. The driving of the coke plant consisted of a spur-geared engine, operating two sets of pawls, which successively thrust the chain in the direction of its travel, engaging both sides simultaneously. The power for driving was obtained from a 10-horse power gas-engine, placed at the end of the gantry, next the riddles, which were also driven by it. The cost of working the plant, per ton of coal carbonized, was—

Coal.

	460 Tons.		600 Tons.
Weighing, shunting, and tipping	0·563d.	..	0·431d.
Breaking	0·550	..	0·420
Conveying	0·650	..	0·500
	1·763	..	1·351
Will be reduced by	0·550	..	0·420
Total	1·213d.	..	0·931d.

Coke.

Labour in tunnel	0·995d.	
Small locomotives	1·030	
Quenching	0·313	
Conveying and riddling	0·936	
Shunting and weighing	0·850	
	4·124	
Cost of coal handling	1·763	
	5·887	
Will be reduced by	0·820	
Total	5·067d. ..	3·904d.
Coal handling		0·931d.
Charging and drawing		2·468
Door opening and shutting		2·113
Coke handling		2·953
Total cost, from railway to railway, per ton of coal carbonized		8·465d.

This was exclusive of pipe-jumping, which amounted to 1·238d. per ton of coal.

Discussion.

Mr. P. M'Dougall (Airdrie) said he thought the great drawback to the adoption of mechanical conveyors in Scotland was that the gas-works were too small. The plant Mr. Webster had described could not be operated in works producing from 50 to 100 million cubic feet per annum at the same cost as in large works. It might be of interest if Mr. Webster could give an estimate of what plant of this sort would cost for works of (say) 100 million cubic feet per annum. It seemed to be a very simple plant, and easily manipulated, and would be of use in small works, if understood. He might also give them some opinion as to the effect of the machinery in pulverizing the coal and causing breeze, requiring very much heavier charges. He would also like to know whether coal was taken from the store, or from waggons only.

Mr. A. H. Whitelaw (Glasgow) said he knew a little about the plant Mr. Webster had described. He believed that men in gas-works now advocated the taking out of shafts and putting in plant with chain driving. One important feature at Provan was the shoots for taking the coke down to the producer level, and having it removed by the small locomotives.

Mr. W. A. White (Falkirk) looked upon the coal-handling plant as being all right, but did not think coke-handling plant was adaptable to every size of works.

Mr. J. Fraser (Glasgow) mentioned that the handling of coke by two men at 4s. 2d. per day, dealing with 15 tons, worked out at 6·6d. per ton.

Mr. T. Lighbody (Renfrew) remarked that the figures produced were a revelation. He would like to ask if anything was allowed for maintenance. It seemed to him that 8·465d. per ton of coal carbonized, from the railway waggon to the coke-heap, was a long way ahead of anything they had had in the West of Scotland. It amounted to less than 1d. per 1000 cubic feet. Did the figures represent the cost from the waggon to the coke-heap, and not from the coal-store to the coke-heap? When coal was stored, it required something extra to take it out of the store.

Mr. Webster replied that they had not taken any coal out of store. The figures were for coal tipped into the breaker, carbonized, and the coke put into waggons. If he had taken the pipe-jumpers into account, it would have come to about 1d.—scarcely 1d.—more per ton; and this was practically all the carbonizing charge. He had allowed nothing for maintenance. Their coke-conveyor during the last two months had not cost a penny for repair.

Mr. C. Watson (Glasgow) asked if the figures included labour and fuel, and interest on capital.

The President said they did not include either fuel or interest on capital. They were simply wages paid.

Mr. Webster added that they had not been long enough at work for them to form an idea of what the cost of maintenance would be.

The President remarked that several members had requested information which it was very difficult to give. It had been asked what the approximate cost would be for plant for works producing 100 million cubic feet of gas per annum. Of course, no one could give that off-hand, as so much depended on the site and the method of working, as well as on the whole of the conditions to be dealt with. Plant such as Mr. Webster had described was only applicable to large works; and it was necessitated, to a great extent, by the charging and drawing machinery put in there. The type of conveyor which had been adopted required, for proper working, a measuring drum for both coal and coke hoppers, to regulate the material to a constant stream. The coke-conveyor at Provan had worked continuously for two months, without giving the least trouble; and he might say that this had occurred since a measuring-drum was fitted. One had lately been put on the coal-conveyor; and though it had only been running for a day or two, they hoped to find the same thing in that case as with the coke-conveyor.

Mr. Webster, in replying upon the discussion, said that, by digging a pit, they might have their coal breakers and conveyors equally well with a railway on the ground floor as with an elevated railway. To convey coke and elevate it in one continuous conveyor he considered a very expensive plan. If they quenched coke in a conveyor, the wear and tear was enormous. If it were at all possible, coke should be quenched clear of the conveyor. They might carry hot coke in a conveyor with very little trouble; but the moment they attempted to quench it their sorrows began. He had had two years' experience of this. In Provan, they used small locomotives to convey coke in the retort-house principally to make sure that they had no interruptions. If a conveyor broke down, their works were practically stopped; but if one locomotive broke down, it did not disarrange the whole work.

CARBONIZATION OF COAL.

Mr. A. Mackay (Montrose) intended to have read a paper on "The Carbonization of Coal and Condensation of Coal Gas." He, however, said these were two operations which were so very important in the manufacture of gas, that he had deemed it advisable, considering the limited time allowed for papers, to confine himself to the "Carbonization of Coal," leaving condensation to be dealt with in another paper. He then went on to say that carbonization had always been, and would always remain, the process which, of all the gas manager's duties, gave the most concern; for, as had been well said, it was in this operation that money was made or lost in gas-works. He would confine his remarks to two points which he considered the most important to those who were responsible for successful carbonization; he referred to coals and heats. Geologists usually divided coal into four classes; but, for the purposes of the members, he considered, broadly speaking, that two classes would be quite sufficient—viz., coking and non-coking coal. Having described the characteristics and the yield of different classes of coal, the author proceeded to the subject of "Heats." Upon this he remarked that at the gas-works under his charge he had still the direct-fired system, from which he could easily produce from 10,500 to 11,000 cubic feet of 21-candle gas per ton, using 25 per cent. of first-class cannel for enrichment purposes. He should perhaps say that he employed oxide and lime for purification, and admitted from 1·5 to 2 per cent. of air into the gas at the inlet of the exhauster, which would show that he used more cannel than he would otherwise require if air were not admitted. The results given above were obtained at the expense of from 2 to 2·5 per cent. of fuel. The regenerative system of firing had come to aid the gas manager in at least reducing his fuel account from 33 to 35 per cent. Since its inauguration, the system had been so improved and simplified that a setting could now be constructed at moderate cost, and in such a way that, by careful manipulation, the heats at any part of the retort were under perfect control. In general, as the temperatures were raised, the quantity of gas generated increased, but at the expense of the illuminating power of the gas, which was reduced; this being caused by the splitting up of the hydrocarbons into simpler compounds, until at the end of the charge only free hydrogen was given off. On the other hand, with a low temperature, the quantity of gas generated was considerably less, while the amount of tar was increased; the gas in this case being of high illuminating power. He was sometimes inclined to think that they worked with heats so as to get as high a make of gas per ton return at the end of the month as possible. This was often false economy; for if the illuminating power had to be kept up to (say) 22 candles, it only meant that, on the other hand, money was thrown away upon enriching materials, some of which might be saved by letting the charges come off a little black. Again, the effect of high heats tended to destroy the paraffin hydrocarbons, and hydrocarbons of the benzene series were formed, with an increased volume of gas. With similar heats, cannel gave off lighter tars, containing more paraffins than ordinary coal tar. This could be partially explained by the fact that the volatile matter in cannel came off more quickly than in common coal, and consequently was not so long in contact with the hot walls of the retort. The temperature of distillation also played an important part in the production of ammonia; the quantity increasing with the increase of temperature up to a certain point, at which the production was at its maximum. If the temperature were increased, the ammonia suffered decomposition, being partly resolved into its constituent elements, hydrogen and nitrogen, and partly, by the agency of the red-hot coke, into cyanogen in the form of hydrocyanic acid. The effect of the high heats upon the carbonic acid, sulphuretted hydrogen, and carbon bisulphide was that these impurities were increased. Carbonizing the same coal to produce 7500 and 11,187 cubic feet of gas per ton, they were increased at the high temperature 88·60, 79·47, and 67·50 per cent. respectively.

Discussion.

Mr. J. Bell (Airdrie) said he considered it was advisable to get as much gas as they could per ton of coal, and not trouble about the illuminating power. It was not illuminating power they strove for now, but heat.

Mr. Whitelaw, referring to the remarks upon coke, said that at Kilsyth that day fortnight they saw one of the best illustrations of the statement about the coke from some varieties of coal not retaining the form of the coal. They saw the coal coming from the colliery, being washed and ground very fine indeed, and then elevated and conveyed into the ovens almost in a state of mud. They put 4 tons of coal into an oven, and got 3 tons of coke, with a carbonization of 24 hours. The coke came out in nice long sticks, having no resemblance whatever to mud. He would have liked to hear Mr. Mackay say something about the duration of the charges. The usual time was four hours; but it might be advisable to increase it to five or even six hours, because it was admitted that the longer the operation took the better was the quality of the coke.

Mr. Webster agreed with Mr. Mackay that where they had to keep up a certain quality of gas—say, 20 candles—it was better to take out the coal barely carbonized than to get the full quantity of gas from it. At Provan they took out from 9500 to 9600 cubic feet per ton, keeping their gas at from 19·80 to 21 candles. They worked with about 8 per cent. of first-class cannel. If they were taking more gas out of the coal, they would have to enrich more. They would then have more carbonic acid, and purification would cost more.

Mr. P. M'Dougall asked what Mr. Mackay thought about dip and anti-dip pipes, and also as to separating the tar from the gas in the tar-seal.

Mr. J. M'Leod (Glasgow) said that, according to experiments he made some time ago in carbonizing coal at different temperatures, he found he reached a point where there was a very considerable loss in sperm value; and he agreed thoroughly with Mr. Webster

when he said that there was a point especially for Scotch coal—say, between 9300 and 9600 cubic feet—where they obtained the maximum sperm value. This point was, he thought, the best one at which to stop carbonizing. He understood Mr. Mackay to say that he split up the benzene compounds. This would require some elucidation. As matter of fact, they could make benzene by heating acetylene to a red heat in a closed tube. If they could do this, did it follow that, by raising benzene to a still higher temperature, they could produce acetylene? He was not perfectly sure upon this point, and did not think he had seen it mentioned anywhere. Mr. Mackay took the usual simple straightforward view that by burning coke they got the reaction $C + O_2 = CO_2$. This served very well for technical purposes; but it had been clearly proved quite recently that it was not the case. They really got several intermediate products; they had an aldehyde and a hydroxylate compound, and then carbonic acid as an ultimate compound, which, passing up through a red-hot bed of fuel, gave carbonic oxide.

Mr. J. Simpson (Glasgow) said Mr. Mackay's remarks with regard to the product of coal as carbonized did not, in his opinion, apply to all coal, and especially to coking coal. They knew that splint coal was often crushed up and made into foundry coke, and that they could not identify it after it had been carbonized. But there were other coals, the patterns of which after carbonizing were very marked. The quality of a coal served as an excuse for a good many things. It was not unusual for gas managers to blame the coal because their make went down.

Mr. Mackay said his remarks were founded upon local works. He was an advocate of low-grade gas. He worked four-hour charges, and considered that in this time he obtained the best quality of coke. With longer charges, they might get a hard char. He would not like to give an opinion as to dip or seal pipes. As to hydraulic seals, he had had a very strange experience since he went to Montrose. At the end of the hydraulic main there was a tar-valve. When he let down one of the benches, he instructed a man to put off the valve; but it was found to be pitched and would not move. He attributed this to high heats. He was much obliged to Mr. Simpson for his remarks about coal.

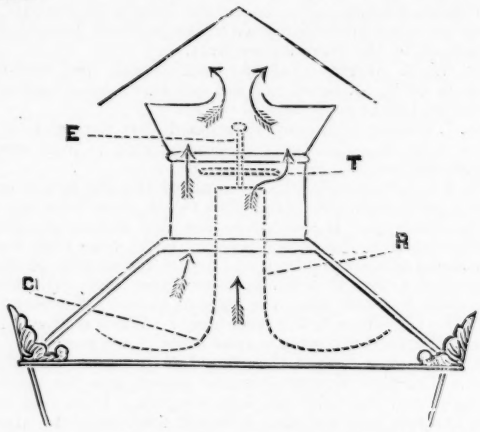
SOCIETY OF ENGINEERS.

The First Ordinary Meeting of the Society for the present year was held at the Royal United Service Institution, Whitehall, on Monday last week. Mr. D. B. Butler, the retiring President, occupied the chair at the opening of the proceedings, and presented the premiums awarded for papers read during his term of office. He then introduced his successor, Mr. N. J. West, who delivered his Inaugural Address.

The President dealt mainly with the mechanical side of engineering, with reference to the historical use and improvement of pumping and marine engines, and the application of the latter at various periods to vessels of different kinds, and included a reference to the latest phase of turbine propulsion. He first gave a historical account of Cornish pumping-engines; tracing their gradual development at the hands of Savery, Newcomen, Trevithick, Watt, Hornblower, and Woolf, and describing the inventions and adaptations of these pioneers of steam-pumping engines. He noted as an interesting point that, incredible as it might seem, for 50 years the use of the steam-engine was confined to the pumping of water. It was not until 1780 that rotary motion was obtained from it by means of a crank. Watt objected to the use of the engine if the crank was attached to it, and invented the sun-and-planet wheel in place of the crank. In 1837, Cornish engines were first introduced for pumping water for the supply of London at the works of the East London Water Company. One was purchased in Cornwall, having a 90-inch cylinder and a 10-feet stroke. It worked most economically for 25 years, and was only removed when the pumping-works were closed in 1892. Mr. West remarked that this class of engine is extensively used in the large water-works in London and elsewhere. He then went on to refer to the pumping plant at the Severn Tunnel, which, he said, was the largest within his knowledge. It was entirely of the Cornish type; and the engines and pumps had a total pumping capacity of 66 million gallons in 24 hours. The quantity dealt with under ordinary circumstances varied from 16 to 34 millions. Marine propulsion was the next branch of steam engineering discussed; and the President dealt with it historically—tracing the progressive steps of its development from the year 1801, at the hands successively of Symington, Fulton, Trevithick, Bell, Brunel, Ericsson, John Elder, and others. Referring to the economy of the marine engine of the present day over that of the earlier types, he pointed out that the steam-turbine would seem to lend itself to still further economies. These turbines direct-coupled to multiple centrifugal pumps were raising from 400 to 600 gallons per minute against a head of more than 700 feet, with a steam consumption of less than 30 lbs. per horse-power-hour measured in water lifted, including turbine losses, as well as pump and pipe resistances. Fan blowers driven by steam-turbines were in use for supplying air to blast-furnaces under a pressure of 5 lbs. per square inch at a rate of 100 cubic feet per second, with a total combined efficiency of 40 per cent. These results showed that the steam-turbine offered possibilities far beyond those of its own economy in steam consumption.

BENNETT'S PATENT STORM-PROOF LAMP.

The particular situation of a gas manager in many cases is productive of special methods—small they may be, but in his experience useful—and sometimes improvement in apparatus or appliances to meet his special needs. Nothing is less astonishing, therefore, than that Mr. C. V. Bennett, being located at Herne Bay, and consequently having many of his street-lamps exposed to the fury of gale and storm, should turn his attention to the production of a street-lamp proof against down draught, in order that his incandescent mantles may be preserved, and the illuminating efficiency of the lamps be kept free from fluctuation. He has patented the head of a lamp designed with these objects in view; and his satisfaction with its successful operation is the result of a twelvemonth's experience in some of the most trying positions for a lamp at the much-favoured sea-side resort mentioned.



Looking at the illustration, it will be seen that we have, in the first place, in the head a porcelain convex cone C. Carried from this is the central chimney R, from the top of which is a spindle E, on which automatically works (by means of the up and down draughts) a talc disc T. The disc—this is an important point—is larger in diameter than the chimney below; and it is prevented from seating itself on the chimney, in the event of a violent down-draught, by a little support rising some ½-inch or so above the chimney. The top ventilating hood is also of special design. It is made of heavy sheet copper, and so is practically imperishable. Its weight is sufficient to keep it in position; but to prevent any possibility of accident, two small screws are used to fix it. It will thus be seen that the head of the lamp is easily accessible for any purpose. But the construction of this top hood is also such that it contributes to the efficiency of the protecting arrangement. Just under the top cone-shaped cover, there is a perforated band of metal for ventilating purposes; and, within the head, there is a baffle-plate, with a central hole of smaller diameter than the talc disc above the chimney below. But it is also noticeable that the edges of the baffle-plate around the hole are turned upwards. These may strike one as being all small points taken individually; but together they effect the objects Mr. Bennett sought for. Obstacles to down-draughts on to the tops of the mantles are provided in every position. In a hurricane, the turned-up edges of the baffle-plate first intercepts any entering wind. Any which has been checked of its severity that passes down the central opening is next deflected from the chimney above the burners by the talc disc; and then round the outer parts of the chimney it encounters the convex disc. The whole of which, it is found, renders even the severest incoming draughts perfectly harmless to the mantles and the effective operation of the burners. On the other hand, with a great increase of heat inside the lantern, the upward current raises the disc (when there is no pressure from down-draught), and so allows greater ventilating freedom. It is found that it is very rarely the talc disc requires renewal; but when it does, as has already been shown, it is a matter of simplicity to remove the ventilating-hood, and supply a new one.

The patented part of the lamp (which is supplied only by Messrs. D. Hulett and Co., Limited, of High Holborn) can be applied to any existing lamps or to any new design.

THE DUTY OF PUMPING-ENGINES.

In the last issue of the "Journal," we gave a number of extracts from the paper dealing with the work of English and Canadian pumping-engines, prepared by Mr. J. Barr, of Kilmarnock, for the meeting of the Institution of Mechanical Engineers on the 20th ult. Among the speakers in the discussion on the paper was Mr. Edmund L. Morris, the Engine Superintendent in the New River district of the Metropolitan Water Board, who

gave a few particulars in regard to the working of some English pumping-engines in London, and especially of a triple-expansion one at the works under his charge at Hornsey.

In his introductory remarks, Mr. Morris said he remembered a paper being read in 1887 on a Cornish pumping-engine erected at water-works in Lincoln; and on that occasion a question was raised by Mr. J. Mair-Rumley as to whether a Cornish engine was better than a rotary one. He had stated that the latter might be expected to work at 18 to 20 lbs. of steam per indicated horse power, against 26 lbs. for the Cornish engine; but since then much progress had been made. He (Mr. Morris) pointed out, when the paper was read, that he thought a triple-expansion engine, working three pumps, would make a very good pumping-engine, by reason of the uniform flow of water it would give. Several engines of this class had been installed in London, and the benefits of the triple-expansion system as applied to pumps were fully appreciated. Such engines had been put up at the East London, the Southwark and Vauxhall, the Grand Junction, and the New River water-works. The New River Company put up eleven—one at Hornsey, two at Clerkenwell, three at Cricklewood, and five at Kempton Park. He had a list of the triple-expansion engines concerning which he had been able to obtain published results. He believed that the engine put up at Waltham Abbey was not the first of this description (it was erected in 1890) in which the steam per indicated horse power was 15·4 lbs. An overhead triple-expansion Worthington engine was put up for the West Middlesex Water Company in 1896, and gave 15·1 lbs. of steam per indicated horse power; and an engine put up in 1899 gave 14·9 lbs. The New River horizontal triple-expansion engine gave 14·2 lbs.; the Southwark and Vauxhall vertical engines at Hampton, tested in 1901, gave 14 lbs. Another New River engine, put up in 1903, gave 13·7 lbs. He believed that an engine at Liverpool gave 12·7 lbs.; while a Lea Bridge engine gave 12·5 lbs. The Allis engine at Chicago in 1893 brought down the steam per indicated horse power to 12·1 lbs.; and a Milwaukee engine—the lowest on record, he believed, at the date of its trial in 1893—used 11·8 lbs. of steam. In March last year, some trials were made at Hornsey of an overhead triple-expansion pumping-engine, having cylinders 21, 34, and 52 inches in diameter respectively, with 4-feet stroke. The following were the results:—

Plungers in use	27 in.	..	18½ in.
Duration of test	12 hours	..	10 hours
Gallons pumped	5,377,000	..	2,123,045
Head	113·8 feet	..	267·7 feet
Revolutions per minute	25·1	..	25·4
Steam pressure at engine	155 lbs.	..	155 lbs.
Pump horse power	257	..	287
Indicated horse power	294·5	..	326
Mechanical efficiency	87 per cent.	..	88 per cent.
Dry steam per pump horse power per hour	13·3 lbs.	..	13 lbs.
Do. per indicated horse power per hour	11·6 ,,	..	11·5 ,,
Duty (gallons) per 1000 lbs. of dry steam	148,800,000	..	152,300,000
Do. per 112 lbs. of coal at an evaporation of 10	166,700,000	..	170,600,000

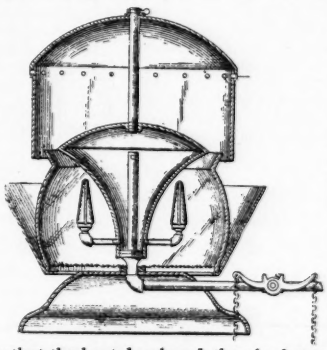
It would thus be seen that the engine gave 11·5 lbs. of steam per indicated horse power. Referring to the results given in Mr. Barr's paper, Mr. Morris pointed out that most of the figures referred to specified duty; but, with the exception of the two described, the engines had not been tested. He assumed that the Chicago engine was about 1000-horse power; and in that instance the duty worked out to 11·3 lbs. per indicated horse power. In the case of the Boston engine—another large one, presumably of about 1000-horse power—the duty of 178,497,000 foot-pounds per 1000 lbs. of steam worked out to 10·3 lbs. of dry steam per indicated horse power. The Hornsey engine was of the ordinary triple-expansion type, actuating three plunger pumps. It had to work two reservoirs at different levels, so that each plunger was divided into two—that was to say, each pump had two plungers working telescopically, one inside the other. The larger plunger, of 27 inches, was used when pumping to the low-level reservoir; and the other plunger, inside, with a diameter of 18½ inches, was used to supply the high-level one. Thus, at the same speed, the engine, working at about the same horse power, would pump to either of the reservoirs. There were air-vessels, such as were described by the author of the paper, on each delivery; there was one at the end of the suction-main, and a surface condenser on the suction-pipe, on the way to the pumps. He thought it would be of interest if the author would give the results of the trials of the other engines mentioned. He (Mr. Morris) noticed that the low-pressure cylinders were mostly fitted with poppet valves, instead of valves of the Corliss type; and very few engines appeared to have surface condensers. He supposed there was good reason for this; and it would be interesting if the author would give it on some future occasion.

Lecturing recently on "The Pressure of Light," Professor Poynting said that more than thirty years ago Clerk-Maxwell, in investigating a new theory of light, was led to the supposition that light pressed with a minute force on any surface on which it fell. Within the last few years this force had actually been detected and measured. Thus the stream of light coming from the lamps in the room in which the lecture was being delivered was pressing down on all the audience, and made, as it were, a small (though very small) addition to the atmospheric pressure.

REGISTER OF PATENTS.

Regenerating Gas Burners and Heaters.—M'Knight, J. W., of Hanover, Penn., U.S.A. No. 599; Jan. 9, 1904. Date claimed under International Convention, Jan. 13, 1903.

This invention relates to a lamp in which burners of the Welsbach type are employed in connection with a regenerating or gas heating-chamber and a heating-drum.



The gas enters the lower portion of the conical regenerating or gas heating-chamber shown, and the pipe, or an extension of it, is carried upwards within the cone and discharges its gas near the upper portion of the cone. The regenerating chamber preferably has its conical sides concave and polished to reflect the light. The burners are mounted upon short pipes, which receive the gas from the lower portion of the chamber and are beneath the outer surface of the regenerator chamber; so that the heat developed thereby heats this chamber. The burners and regenerating chamber are surrounded by a glass globe, the bottom of which is preferably closed by a sheet of wire gauze. A conical reflector may also be supported on the rods. A standard supported from the regenerating chamber carries a heating drum of such size as to enclose by its lower edge the glass globe—the heated air from the burners passing upward between the globe and the regenerating chamber into the heating drum and outwards through the perforations in the drum.

Illumination Devices Connected with Gas-Meters.—Melhuish, A. G., of Chingford, Essex. No. 997; Jan. 14, 1904.

The inventor proposes to utilize a gas-meter as a source of power for operating (say) an auxiliary distributing valve, either rotary or sliding, for distributing or diverting a supply of gas to a larger or smaller number of burners so as to turn up the lights in consecutive order or in varying sequence and then to ultimately, after the predetermined number have been lit, to suddenly turn the whole of them out. The motion and power of the meter when gas is passing through operates an electrical switch or switches to light the burners when the gas is turned on by the valve, or the valve may itself form the switch. When used (say) in connection with a penny-in-the slot meter, it is possible, after the application of the penny and turning on the gas to an illuminating burner, to utilize the consequent motion and power to operate a pictorial device or other apparatus, or to wind up the apparatus; the feature of the invention being to employ the power of a gas-meter to operate a valve or valves to allow gas to pass to different burners through a series of pipes to illuminate a device or a series of devices consecutively, intermittently, or other manner and lower the lights in the same, reverse, or other order, or altogether, and in some cases utilize the power and motion for operating other appliances, whether in combination with the burners and distributing valves or separate therefrom.

As an example, a valve is connected with the worm on the bellows spindle of the meter by a rod, so that the valve can be rotated on the face of a valve-box provided with a series of separate compartments or openings connected to pipes leading to the various burners; and over these openings the valve passes during its movement. The valve has a quadrant-shaped opening; and as it passes the openings in the valve-box, it allows the gas therein to pass up each pipe consecutively. But so soon as the slot uncovers the whole or any desired number of compartments, a cam or its edge allows of, or causes, a stop valve to shut off the supply of gas to the valve-box, and so stop or decrease the supply of gas to the burner. The valve then travels on and clears the openings until the slot again commences to open the compartment, when the stop valve is actuated to refurnish the gas supply to the valve-box for a re-illumination of the burners as before.

Flues for Gas-Stoves.—Adams, W. G., of Bristol. No. 1168; Jan. 16, 1904.

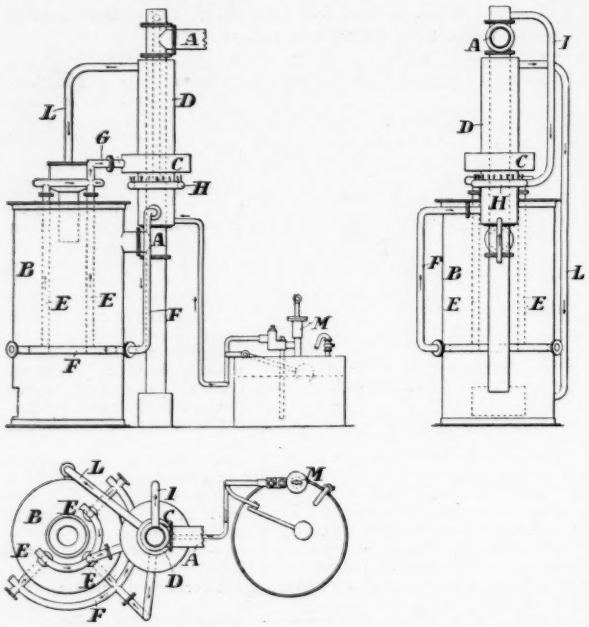
The object of this invention is to construct a flue or hot-air chamber of thin iron, or other suitable metal, which can be fitted to any gas stove, fire, or the like, "which is practically a non-condenser, and has not to be filled with water, so that the gaseous products of combustion from a gas-fire or the like circulating through the flue is the sole heating unit." Broadly, the invention consists of three straight lengths of tubes or piping 3 inches in diameter, connected together with eight elbowpieces, fitted to the back of a gas-fire with an elbow made at an angle to suit the fire place into which the flue or hot-air chamber is to be fitted.

Producing Gas for Gas-Engines and other Purposes.—Prentice, J. S., of Ilminster. No. 5825; March 9, 1904.

This invention relates to apparatus for producing gas for gas-engines and other purposes, and has for its object to obviate the use of a separately fired steam-boiler.

The gas-pipe A of the producer (p. 430) B is surrounded by a boiler consisting of the tube D and the enlarged part C. The producer is provided with internal tubes E connected at their lower ends to an

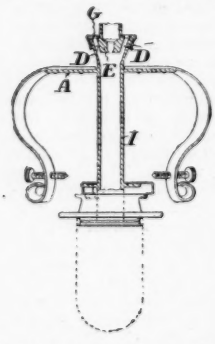
external pipe F leading to the lower part of the tube D, and at their upper ends by an external pipe G to the enlarged part of the boiler, which is heated by producer gas supplied to the burner-ring H by the pipe I. A steam-pipe L leads from the upper part of the tube D to below the grate of the producer.



The fire at the start is blown up by a fan; and when steam is generated, the fan is taken off and steam is admitted to the producer through the pipe L and producer gas given off. The water in the boiler is heated by the pipes E, and circulation takes place through the pipes F E G and boiler parts C and D. The tube D is also heated by the hot producer gas given off and by the burner H. The boiler is supplied with water by a pump M mounted on a tank supplied with a regular stream of water through a graduated cock. The pump is provided with a bye-pass leading to the tank; and this is opened by a float in the tank as the water decreases. The supply water may be taken from the hot-water tank of the engine, "which attains a fairly high temperature after the engine has been working some little time."

Atmospheric Gas-Burners.—Kay, M., of Clapton, N. No. 1304; Jan. 18, 1904.

A burner body constructed according to this invention comprises a plate A from the upper side of which projects a tubular portion serving as a mixing-chamber and having a cover extending across its upper end forming a chamber and closing the tube excepting for some apertures, or the upper part may be solid, as shown, with a number of holes D formed in the cover. This cap or cover is formed with a conical nozzle E arranged concentrically within the tubular portion, into which it enters to within a short distance of its point of intersection by the plate A. The nozzle extends outwardly a suitable distance beyond the cover, and is preferably tapped interiorly as shown for connection to the gas supply. This extension of the nozzle carries a circular plate or valve G, provided with bent-over ears clipping over the burner chamber, and adapted to be rotated so as to regulate the apertures in the chamber. The nozzle E is furnished with a small hole in its lower extremity, or with two or more small holes for the passage of the gas. An annular channel, or a number of channels in the form of an annulus, are thus furnished for the admission of air parallel with and surrounding the gas-inlet. From the under side of the plate depends a tube I, of smaller diameter than the upper end of the upwardly extending tube or mixing-chamber, and near its lower extremity provided with a collar or plate with bent lugs (suitably three), by which the mantle-carrier may be supported or suspended and retained in position. The lugs are preferably bent at their lower ends so that the tendency of the mantle-carrier is to rest centrally with regard to the burner-tube.



Coin-Freed Mechanism for Prepayment Gas-Meters.—Fox, T. (late) of Oldham. No. 6075; March 12, 1904.

Fig. 1 is a plan view of the coin-freed mechanism arranged in connection with an ordinary dry meter—certain of the working parts of the meter being indicated to the right. Fig. 2 is an end elevation of the mechanism with the parts disposed as in fig. 1. Fig. 3 (a vertical section view) shows the actuating star-wheels, the coin-shoots, and other parts.

The coin-shoot A is fashioned with a slot or gap to give access to a coin, and down it the coin rolls or is dropped. In connection with the shoot is arranged a star-wheel B mounted on a spindle. To check backward rotation of the star-wheel, a spring C may be used; the end engaging one of the concavities of the star-wheel, which may have notches so as to be better held by the spring. In order to prevent the wheel being operated or tampered with by an inserted wire or tool, it is roofed over by a projection D, which forms the base of the coin shoot or entrance.

In conjunction with the star-wheel, and (say) at right angles to the centre of it, is arranged a partially rotatable or movable shaft E, carrying a handle and having a projection or operating finger formed on it. Normally, the shaft E, with its finger, may be operated without affecting the mechanism; but when a penny is dropped down the shoot, it bridges the gap between the finger and the wheel, so that rotation of the shaft causes the wheel to make a partial revolution—say, to the extent of one tooth—and free the penny, which falls into a suitable locked-up receptacle. Upon the star-wheel spindle or shaft is a spur-wheel F, which gears with, and transmits motion to, a second spur-wheel G, mounted upon the extremity of a screwed or worm spindle H. This spindle engages a tapped tubular extension (or a nut attached thereto) in connection with the valve governing the supply of gas, so that when the spindle is rotated, its action is to withdraw the valve to the extent determined for the insertion of a single penny.

Fig. 1.

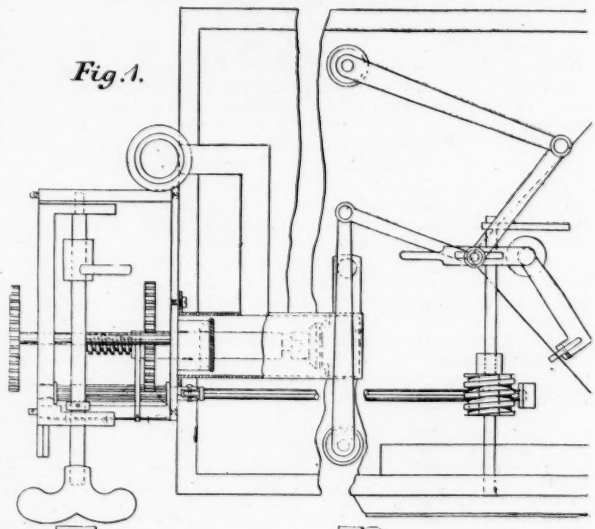


Fig. 2.

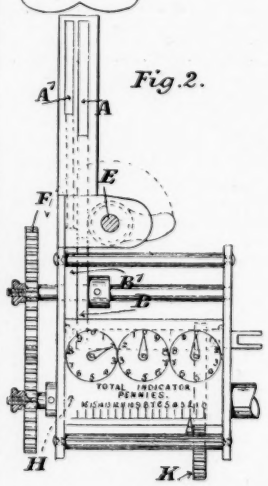
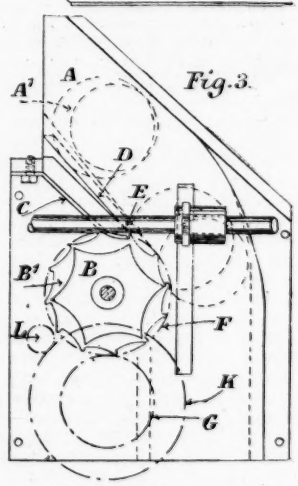


Fig. 3.



When the valve is withdrawn, the gas passing from the meter inlet-pipe enters a tubular valve chamber secured to the attachment, and escapes past the valve. It then enters any ordinary pipe or channel, and escapes through the outlet into the meter, as will be understood. The degree of withdrawal of the valve is governed by the number of teeth in the wheels F and G; and preferably these wheels are change-wheels attached to their spindles so as to be readily removable. By using change-wheels, the traverse of the valve spindle can be made greater or less for a given movement of the star-wheel B—greater or less according to the particular change-wheels in use for the time being. By the use of change-wheels, provision is made for variation according to the price of gas at different times or in different localities.

The mechanism by which the valve spindle is re-traversed or moved back to shut-off the supply of gas consists of a spur-wheel K, of large diameter, gearing with an elongated pinion L; the elongation being necessary to ensure engagement no matter what the position of the larger spur-wheel. This elongated pinion has its shaft or spindle projecting into the meter, and is conveniently driven by the worm and worm wheel gear from the dial shaft; the motive power being the gas passing through the meter, as will be understood.

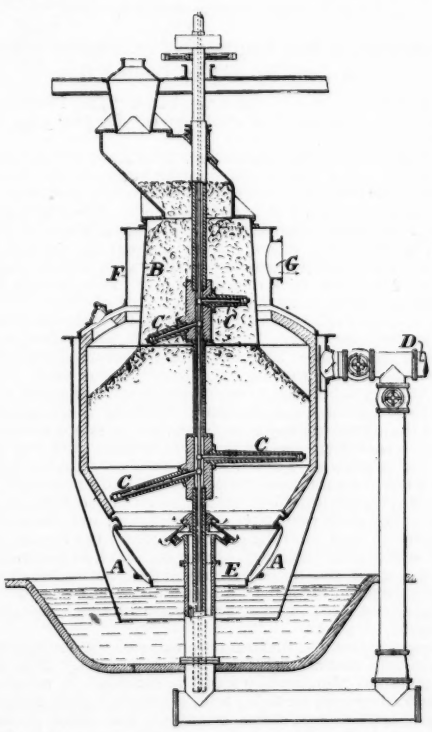
With a view of providing for the actuation of the mechanism by half-pennies, if desired, there is a second coin-shoot A^1, which is designed to admit and guide half-pennies. In conjunction with it is also arranged a star-wheel B^1, having double the number of concavities possessed by the penny star-wheel cut in its periphery, and such half-penny star-wheel is compounded with the penny star-wheel, and revolves with it.

If a half-penny be inserted, it is conducted by the coin-shoot on to a concavity on the half-penny star-wheel, and this is rotated, when the shaft E is operated, to the extent of one concavity. This imparts, through the gearing, a movement to the shaft or spindle equal to one-half the movement imparted to it by the rotation of the star-wheel B when a penny is inserted. The same spring C serves to check backward rotation of both half-penny and penny star-wheels; and in fig. 3 this spring is shown engaging the half-penny star-wheel.

To keep a check on the pennies inserted, a counting device is actuated on the insertion of a coin—deriving its motion from one of the star-wheels. This consists of three dials, as shown in fig. 2, the first dial representing units, the second tens, and the third hundreds—the pointer of the first dial receiving motion from one or other of the star-wheels. Each time the star-wheel B makes a partial rotation, it communicates motion to the pointer on the first dial, and shifts it one-tenth of a revolution; while upon the completion of one revolution of the pointer on dial No. 1, the tens pointer shifts one-tenth of a revolution, and so likewise in turn the hundreds pointer is shifted. Where a half-penny star-wheel is combined with the penny star-wheel as indicated, or where one is used alone, the unit dial would work from the half-penny star-wheel; so that the pointer or dial would be only influenced to the extent of one-twentieth of a revolution on the insertion of a half-penny.

Gas-Producers.—Talbot, B., of Leeds, and Mond, L., of Regent's Park, N.W. No. 6719; March 19, 1904.

Patent No. 12,440 of 1893 was for a gas-producer specially adapted for converting ordinary slack or small coal into producer gases containing a minimum of tarry condensible matters and obtaining as a bye-product a maximum of ammonia. The producer is cylindrical in form, and provided with a grate of the shape of an inverted truncated cone, through which the blast is admitted. In the top of the producer a bell is inserted reaching a considerable distance down into it; and this bell is always kept partly filled with the raw fuel, the volatile constituents of which are, to a certain extent, distilled off in the bell and pass through, and partly over, the incandescent fuel, and are thereby converted into permanent gases. The fuel, thus deprived of a part of its volatile matter, passes continually into the producer, and part of it sinks down right underneath the bell to a considerable depth—forming an egg-shaped mass of dead fuel. If it is attempted to force the producer beyond its capacity, this mass of dead fuel may extend so far downwards that part of it may come out of the producer with the ashes. This construction is specifically referred to in patent No. 8449 of 1901, which describes a modified process by which a portion of the hot gas produced in the body and bell of the producer is caused to pass back again with a certain portion of steam into the middle of the incandescent fuel at a level a little above the fire-bars; it being also proposed that the fuel should be stirred by arms in a manner analogous to that described in patent No. 10,049 of 1900, in which, however, the revolving stirring arms have not only a rotary, but may also have a rising and falling movement; and means are provided for water circulation through the hollow shaft and the stirring arms carried thereby, while the blast is admitted at the top of the ash-pit and directly into the hot zone.

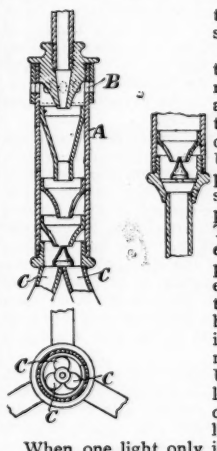


According to the present invention, it is proposed to combine with the general form of producer shell and grate described in the first patent the stirring arms and central blast as described in the patent of 1900, and to provide separate blast inlets for the central blast and for the circular grate provided with regulating valves so that the air, or mixture of air and steam, used for burning the fuel in the producer is made to enter partly through the grate and partly through the central blast "in such proportions as may be found useful to obtain the best quality of gas and the largest yield of bye-products." If desired, stirring arms may be placed in the bell as well as in the main body of the producer, in order to obtain a uniform stirring and breaking up of any caked material. The construction indicated will, it is said, be found particularly useful in connection with ammonia-recovery plants.

One form of a producer constructed in accordance with this invention is shown. The lining of the producer terminates at its lower end in the grate A; while the surrounding jacket dips into the water seal. The bell B extends below the top of the lining, and is connected with a suitable charging shoot. The stirring arms C are carried on a hollow shaft provided with water circulation and mounted as described in the patent of 1900. The air-blast inlet D is branched and provided with valves by which the amount of air passing through the casing to the grate-bars, and that passing to the interior of the fuel through the blast-box E, can be regulated at will, depending upon the result desired. The gases generated rise up into the casing F surrounding a part of the bell, and pass out through the discharge G.

Incandescent Gas-Burners.—Smith, T. B., and the Sunlight and Safety Lamp Company, Limited, of Birmingham. No. 20,916; Sept. 29, 1904.

This invention (primarily intended for inverted incandescent gas-burners) consists of means by which "the light is intensified, a more perfect and pure combustion obtained, and less heat conveyed to the fitting than is usual in fittings of this character." The invention is also particularly adapted to multiple burners."



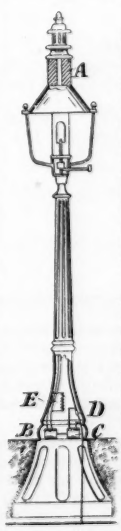
The illustration shows the application of the arrangement to a multiple light; also to a single light.

To the service-pipe is attached the bunsen tube A, having the usual air inlets at B, which may or may not be provided with the usual air-regulator. In the tube A are placed controlling or mixing devices—inverted conical or contracted pipes, one above the other. Usually three of such conical fittings are employed, the central one having its outlet somewhat smaller than the outlet of the upper pipe, while the lower one has its outlet larger. These are placed at a suitable distance from each other as experience may decide—"apparently the best position being such that the exit of an upper cone pipe is about level with the commencement of the taper of the cone below it." Situated beneath the lower cone is an upright cone whose apex lies near to, or may just enter the opening of, the lower cone. Upon the base of the cone are openings C leading to the lights—the number of such openings corresponding to the number of lights employed.

When one light only is required, the upright cone will be carried midway in its chamber by a three-bar support, leaving the passages through which the gas may pass.

By these means, the gas and air, having passed into the inlet pipe, are closed as it were to each other as they pass through the first contracted opening, and "it would appear that they rebound somewhat from the sides of the cones, which thus ensure a thorough mixing of the gas and air; the force of its passage thence being somewhat intensified as it passes on to the second cone, and ultimately again further divides or breaks up its particles upon the upright cone."

Producing High-Pressure Incandescent Gas-Light without Central Compression Plant and Separate High-Pressure Mains.—Salzenberg, E., of Brussels. No. 25,185; Nov. 19, 1904.



This "process of producing intensified gas-light consists in utilizing the heat which up to now has been allowed to escape from a lamp or the like, for heating purposes, and, more particularly, for heating one or more thermopiles arranged above the lamp." For the thermopiles, there may be substituted "other equivalent devices capable of producing electric energy, which is converted into mechanical energy by any suitable electro-motor, combined with a suitable blast engine or exhauster, inserted into the actual normal pressure pipe of a lamp in close proximity to the burner to be intensified, whereby the gas under normal pressure is sucked from the pipe or main, compressed, and brought in a compressed state to the incandescent body."

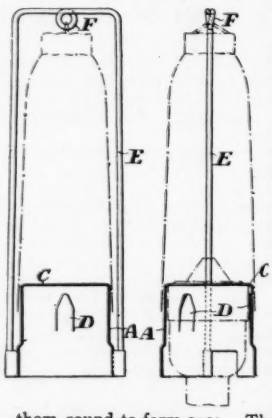
The patentee shows a "practical embodiment" of his invention—an ordinary street-lamp, with the thermopile A arranged to be heated by the lamp-burner. The electric current generated by the thermopile is brought through wires to a suitable electro-motor B, connected to a small blast-engine or exhauster C, inserted into the actual normal pressure pipe, so as to suck the gas under normal pressure from the pipe and main and force it in a compressed state to the incandescent body of the lamp-burner. D is a return-valve, which is closed during the operation of the blast-engine. E is a rheostat or resistance arranged near to the electro-motor, and which may be inserted into the circuit when it is desired to absorb the current generated by the thermopile and have the lighting gas brought to the burner without compression.

Working Combustion Motors in Combination with Gas-Producers.—Sonderegger, C., of Zürich, Switzerland. No. 25,861; Nov. 28, 1904. Date claimed under International Convention, Dec. 9, 1903.

This invention relates to the working of combustion motors so as to allow of the motor being started and reversed without the aid of external forces, accumulators, compressed mixtures, compressed air, or mechanical auxiliary apparatus. The process consists substantially in supplying air to a gas-producer which is connected with the working cylinder by means of the working cylinder itself in such a manner that the pressure in the gas-producer will remain constant while the load on the motor is constant, but which, as the load decreases, will constantly increase and, when the motor is being stopped, will reach a maximum limit which must not be exceeded.

Mantle Supports for Incandescent Gas-Burners.—Falk, Stadelmann, and Co., Limited, and Falk, S., of Farringdon Road, E.C. No. 26,373; Dec. 3, 1904.

This invention has for its object to provide a support in which "there is no liability of the mantle becoming disarranged, and which is so cheaply constructed that it can be sold with the mantle and thus serve as a guard for preventing breakage in transport, and which, when the mantle is burnt out or useless, can be discarded."



As shown, a collar A, of spun metal, is adapted to readily slip over the head of the ordinary burner. At its upper end, it is formed with an inturned lip or flange C, which rests upon the top of the burner and has a number of spring tongues D formed on the body so as to ensure that the collar shall fit notwithstanding slight variations in the diameter of burners.

E is a stirrup or frame which, on the top cross-bar, is provided with a spiral loop from which the mantle is suspended, and which, at the lower extremities, is carried in eyes formed upon the collar by cutting tongues out of the base of the collar and bending them round to form eyes. The advantage of the spiral eye F on the cross-bar of the stirrip is that, when the mantle is in place, it is impossible for the upper end of the mantle to become displaced upon the cross-bar, and so allow of the sides of the mantle coming into contact with the side bars of the stirrup, as would be the case if a single notch were formed.

In applying the mantle, the latter is first suspended in the stirrup, and then the stirrup, with the mantle upon it, is applied to the collar; the end of the mantle being fitted over the collar. The ends of the stirrup are then placed in the eyes, and the latter are nipped so as to prevent the stirrup from becoming detached.

When the complete support, with the mantle upon it, is placed in the usual box for transport, the side bars of the stirrip E serve as a guide for introducing the mantle into the box and also serve (when the mantle is in position upon the burner) as a guide for putting the chimney into place.

APPLICATIONS FOR LETTERS PATENT.

1762.—Pare, W., "Lighting gas-lamps." Jan. 30.
1795.—Wakefield, C. C., and Grimes, W., "Gas-burners."
1843.—Grice, H. J., "Gas-producer." Jan. 31. [Jan. 30.
1865.—Oddie, W. M., "Bye-passes." Jan. 31,
1869.—Vass, D., "Lighting and extinguishing gas." Jan. 31.
1934.—Allan, A., "Charging retorts." Jan. 31.
1958.—Stanley, C. E., and Haines, A. C., "Base for supporting incandescent burners." Feb. 1.
1997.—Smith, W. B., "Burners." Feb. 1.
2024.—Harper, R. R., "Inverted incandescent burners." Feb. 1.
2062.—Wright, H. F., and Benson, R. S., "Bye-passes for automatically relieving the purifiers and other parts of gas-works and their connections from abnormal pressures of gas." Feb. 2.
2077.—Terry, G., "Inverted incandescent gas lighting." Feb. 2.
2096.—Roessler, A. C., and the Air Light Company, Ltd., "Gas-lamps." Feb. 2.
2124.—Bell, H. P., "Gas-producers." Feb. 3.
2136.—Reece, F. W., "Lighting of street incandescent gas-lamps."
2186.—Steinicke, T., "Bunsen-burners." Feb. 3. [Feb. 3.
2205.—Clayton, R., "Gas-heated iron." Feb. 4.
2232.—Scott Snell, C., and the Air Light Company, Ltd., "Nipples for gas lighting." Feb. 4.

Leakage of Gas into Dwelling-Houses.—The motion on this subject by Sir William Collins, which stood on the *agenda* for the meeting of the London County Council last Tuesday (*ante*, p. 380), was not reached until past seven o'clock, after which hour, by the Standing Orders of the Council, only unopposed business can be taken; and as this was opposed, its consideration was adjourned.

South Hayling Parish Council and the Gas Company's Order.—At a special meeting of the Council held to consider the application made to the Board of Trade by the Hayling Island Gas Company for a Provisional Order, a resolution was passed to the effect that, in the Council's opinion, the quality of the gas should be not less than 16 candles and the price 5s. per 1000 cubic feet, instead of 12 candles and 6s. as proposed by the Company.

CORRESPONDENCE.

[*We are not responsible for opinions expressed by Correspondents.*]

Systems of Testing Illuminating Gas.

Sir,—I am always pleased to see any comments on the vexed question of the best means to be adopted for the testing of the illuminating power of the public gas supply; but the article by "Critic" in the last issue of the "Journal" does not appeal to me as affording any lucid suggestion to meet the needs of the question. Criticism is often easy; useful suggestions are possibly more difficult. "Critic" ignores so many "circumstances which alter cases," that I may perhaps be pardoned for criticizing the "Critic" in a friendly way over a few matters.

"Critic" asks "Where is the 'Wandsworth' burner?" Mr. Abady certainly found in some grades of gas that this burner gave a comparatively high result; but he characterized it as a bad burner for the consumer, as the character of its flame is defective, and it is "an inelastic burner." With this view, I entirely agree. The flame tapers considerably at the apex, and a slight draught or extra consumption readily produces "tailing." For the sake of the avoidance of the complication of a multiplication of standard burners for different grades of gas, it is certainly advisable if possible to adopt one standard burner of an "elastic" description and affording a stable flame. Sugg's "London" No. 1 argand does this. The dimensions of construction being rigidly described, there is no reason why "Critic" should anticipate the necessity of altering its *photometrical* nomenclature with a difference in the way of using it. The use of this burner for different grades of gas may be admitted as something of a compromise. But can a better suggestion be made in the absence of the ideally perfect burner which will or might afford the highest results for each grade of gas? All methods of gas testing are more or less compromises adopted for the sake of convenience, and quite apart from any ideal development of illuminating power.

Speaking of testing burners, "Critic" says, at the conclusion of his article, "incandescent burners cannot be considered as valuers of this commodity, more especially since Professor Lewes has demonstrated that a good light can be obtained from a gas void of any self-illumination." This is practically true; but the scientific fact should not be ignored, that the difference between the so-called self-illumination and the incandescent is that the former relies for light development on the incandescence of carbon particles, and the latter on the incandescence of some of the rarer earths, and that the latter system is by far the more economical of the two.

Feb. 11, 1905. H. Leicester Greville, F.I.C., F.C.S, &c.

Sir,—Your correspondent "Critic," in an article entitled "Systems of Testing Illuminating Gas," raises some theoretical points with regard to tests made by me. If "Critic" will state his name, I shall be very pleased to clear up his difficulties.

Earl Street, S.W., Feb. 10, 1905. Jacques Abady.

The Profession of Gas Engineering in America.—Distillation of Coal by Highly Heated Gas.

Sir,—Reading your editorial remarks on "The Profession of Gas Engineering in America" in the "Journal" for Jan. 3 has started the desire to write to you.

I could say a few things about the "Profession of Gas Engineering in America;" and I think I will. In the years 1891-92, believing that there would be enough business to warrant it, I opened an office as a general Consulting Gas Engineer at St. Louis, Miss. I believe that at that date I was personally the equal of any gas engineer in this country as to popularity among fellow gas men throughout the United States. I could tell a number of anecdotes corroborative of this statement, but am not writing or feeling in the reminiscent mood, neither do I desire to become tedious to you.

But I will speak of only one incident—that a plain fact—of the value of a consulting engineer. The President of a Gas Company which I had formerly served as Engineer and Superintendent, sent me the specifications and contract for the rebuilding of a small (75,000 cubic feet) gasholder; asking me to took them over for him and report. The job was to cost $6000; and the result of calling in the consulting engineer was that the Company got a better job for $4000 *and from the same contractors who had bid the former sum.* Besides this, the contractors offered to give me a good stiff commission if they got the job.

After a trial extending over a period of eighteen months, I gave up my first attempt to establish myself as *an independent* consulting gas engineer. But some years later I tried it again, and—being fortunately not dependent upon what the business might bring in—am still trying. Though widely advertised, well known still, and, as you may know, not behind the age in our profession, my experience is that the call for a consulting engineer in the gas profession in America is mostly limited to asking advice free; often without even enclosing a postage stamp for return mail.

Another incident will illustrate the value of the consulting engineer, if it were only realized by those most concerned. This is of recent date: A certain Municipality found it necessary to rebuild their gas plant, and advertised for bids; and, of course, nearly everybody in the country submitted proposals. Finally, I was called in consultation, with the result that I found the apparatus proposed in the best and lowest "lump" bid, could be furnished per item for a sum aggregating 20 per cent. *less.* For this service my compensation was one-half of one per cent. *of the saving;* and, when you now take up any recent issue of the "American Gaslight Journal," and read the "fraternal" invitation of the "Editor of the Information Bureau of the Ohio Gaslight Association," you may conclude I was lucky to get even that.

I will conclude this subject by taking from your columns your quotation of one of the things "P" said in the article upon which you commented: "The profession of engineering in the United States has never been more than a name." But, I beg leave to add, that view of the matter is certainly true only in part. Although there are some 800 gas companies in the United States, one alone—in the American Metropolis—does sell nearly as much gas in a year as is produced by all the rest, if we take out only a few of the leading cities; and no one here or abroad can justly point to a lack of the true engineering spirit or skill in the chiefs or staff of these companies.

And there are others, though the consulting engineer is not appreciated as one personally interested thinks he should, deserves, and ought to be, to the profit of many concerned.

I send you one of a thousand letters, by which—with a goodly number of "personal" letters to supposed friends, and a lot of costly advertising—I used to make it known that I was open for business as a "Consulting Gas Engineer." I prided myself especially on the definition of the scope of the professional duties of the consulting gas engineer which I managed to build up. This is what I said—

The advantages accruing from occasional consultations with an experienced but independent gas engineer, have found full recognition in Europe for years; convincing me that we could follow that example with profit in this country also.

The range of the consulting gas engineer's sphere is: The giving of advice in connection with planning, erecting, and managing gas-works, and the distribution of their products; investigating and reporting on the utility of alleged improvements for the manufacture of gas, and proposed or patented processes; making estimates of cost of new and appraising actual value of existing gas plants; and, finally, furnishing information to bankers, corporations, or individuals who may require it as to the relation of earning power to capitalization of such plants.

Furnishing apparatus or material, or contracting to build plants in part or entire, is not embraced in the proper curriculum of the consulting gas engineer, and therefore will not be undertaken by me. Only advice on these subjects will be given, if asked for.

In furtherance of the same object, I made journeys aggregating 3800 miles; and the net results of all my labours as a consulting gas engineer can only be expressed by an algebraical quantity, or, let us put it this way "$-x$," the "x" representing a good many more than $1000.

Yes, indeed, "the profession of Gas Engineering in the United States has never been (neither is yet) more than a name," *in some respects*, as "Q. E. D.," per above.

Now in respect to another matter. In the "Journal für Gasbeleuchtung" of Oct. 24 and Dec. 3 last, I found an article on "The Distillation of Coal by Highly Heated Gases," which I find condensed in your columns in the "JOURNAL" for Jan. 3. In connection with this, I send you a copy of an American Patent, issued to me for the same purpose in June, 1889. So you see our German friends were not the first in that direction. Maybe, I was not either.

The story of how that "invention" was made is as follows: Mr. John W. Harrison, then President of the Shickle, Harrison, and Howard Iron-Works of St. Louis, Mo., visited me one day, and to my surprise suggested that I should invent a new gas process, and promised that he would furnish the necessary money to obtain the patents. He was very rich. No suggestion was made as to what the new process was to be; and I had no idea what I would do at the time. But he insisted that I should go on and "invent something."

Soon after this the idea occurred to me which you see illustrated in the enclosed papers. I tried it to a finish in my laboratory at the Laclede Gas-Works at St. Louis, and then applied for a patent—joining Mr. Harrison's name with mine, to secure him the share of the patent which we had previously agreed upon. In due time, the patent was granted. For some unknown reason, Mr. Harrison would not furnish the money to put up an apparatus on a working scale, and I gave the matter no further attention, until the articles in your and the German "Journal" reminded me once more of it. In connection with this patent, I applied for, and obtained, a patent for a valve (a fire-proof affair) to be used with the same apparatus.

The idea of distilling gases in the way indicated is not without several good points. I had them worked out once, and shall be pleased if our German fellow craftsmen should make a success of the method.

Norfolk, Va., Jan. 19, 1905. FREDERIC EGNER.

The specification referred to in the latter part of Mr. Egner's letter shows that the application for the patent was filed on Jan. 16, 1889. The invention was in "apparatus for the manufacture of fuel and illuminating gas;" and these claims are set out by the patentees at the foot of the specification:—

What we claim as new and of our own invention is as follows:

1. The combination of a water-gas generator or producer, a superheater which receives the gases from the generator, a coal-distilling chamber which receives the gases from the superheater, and a bench of retorts to which the gases and vapours from the coal-distilling chamber directly pass, the whole connected and adapted to operate substantially in the manner set forth.

2. The combination, with the water-gas generators or sets, of generators, superheaters (one for each water-gas generator or set of generators), and the coal-distilling chamber, common to said superheaters; these elements being constructed, connected together, and adapted to jointly operate substantially in the manner and for the purposes set forth.

3. In combination with the retort-bench and the coal-distilling chamber, the regulator or superheater provided with three valve-controlled outlets, the one leading to the atmosphere, the next to the coal-distilling chamber, and the third to the combustion chamber or furnace of the retort-bench, substantially as and for the purposes set forth.

4. In combination with the superheaters and retort-bench; the intermediate coal-distilling chamber, connected on the one hand with the superheaters and on the other hand with the retorts, and provided with an air and steam inspirator, substantially as and for the purposes set forth.

Mr. Charles Vine, of Church Street, Basingstoke, who was for many years connected with the Basingstoke Gas Company, left six cottages in trust for the use, at a nominal rent, of persons employed by the Company.

LEGAL INTELLIGENCE.

GREENWICH POLICE COURT—Tuesday, Feb. 7.

(*Before Mr.* ERNEST BAGGALLAY.)

Lewisham Borough Council v. South Suburban Gas Company. Sulphur Compounds—The Question of "Unavoidable Cause."

Complying with a wish expressed by his Worship, that "rebutting evidence" should be given before he delivered his decision in this case, further witnesses were heard to-day. The proceedings at the first hearing were reported in the "JOURNAL" for the 31st ult.

Mr. TEMPLER L. DOWN, Solicitor to the Borough Council, appeared in support of the summons; Mr. HORACE AVORY, K.C., and Mr. T. T. BLYTH (instructed by Mr. C. F. T. Blyth, of Messrs. Blyth, Dutton, Hartley, and Blyth) represented the Company.

Upon an opening remark from Mr. DOWN,

Mr. AVORY said that apparently the plaintiffs were going to dispute the findings of the Board of Trade Committee. He had not anticipated this, and so should want to call one or two witnesses to support Sir George Livesey.

Mr. BAGGALLAY asked how the findings of the Board of Trade Committee were in issue at all. So far as he could see, they were only in issue on the point of the punishment in the event of conviction.

Mr. AVORY replied that they were put in issue by evidence being called to show that lime could be used without causing a nuisance. This was what he gathered was the purpose of the evidence the other side was going to give.

Mr. BAGGALLAY said the Board of Trade Committee's report was not in evidence for the purpose in question. Mr. Avory had called Sir George; and his evidence was verbal evidence. He (Mr. Baggallay) was not at all sure the Committee's report could be given as evidence, or could be made evidence.

Mr. AVORY thought it might be in this way, that it could be used to show "unavoidable cause." He was taken by surprise to this extent, that he did not think evidence would be called on the other side to contradict the report of the Committee.

Mr. BAGGALLAY: I have the evidence of Sir George, who has been cross-examined on it.

Mr. AVORY said he must admit he could only call further evidence by indulgence, because of the peculiar position of the Company.

Mr. BAGGALLAY remarked that, judging by the cross-examination, he was bound to confess that his view was that the lime question was not so much in dispute as the one as to whether other coal might be used. This he could only gather from the cross-examination. He did not express any opinion upon it, because he did not know what evidence Mr. Down was going to call.

Mr. AVORY said he did not think he ought to call further evidence now. He could not insist upon it.

Mr. BAGGALLAY: I think not.

Mr. DOWN then expressed a desire to submit two or three points on the question as to the meaning of "unavoidable cause," and on the argument that the Company were unable to purify by lime without causing a nuisance.

Mr. BAGGALLAY said he did not see any harm in this; at the same time, the duty of pointing out any question of this sort came in the opening.

Mr. DOWN said he was speaking to section 28 of the Company's Act of 1893, sub-section *c*, in reference to no forfeiture being incurred in any case in respect of any excess that was caused by "unavoidable cause or accident." As to the meaning of the phrase "unavoidable cause or accident," he must submit that "unavoidable cause" must be a physical impossibility—that was to say, a cause which might be effected or surmounted by the expenditure of money was not an "unavoidable cause." In the case of *Morris v. Smith*, Lord Mansfield said unavoidable accident meant an accident physically unavoidable. (By inquiry Mr. Avory learnt that this was a case in 1760 or 1770, which learned Counsel described as a "period of oblivion." Mr. Baggallay also thought they might have something, say, within the last hundred years.) Mr. Down then referred to the case of the "*Merchant Prince*," in which Lord Esher said "inevitable" meant "unavoidable;" and Lord Justice Fry held that an unavoidable accident was one which could not be avoided by the exercise of ordinary care and caution and maritime skill. Also in the case of "*Virgil*," it was laid down that an unavoidable accident in point of law was that which a party charged with an offence could not possibly prevent by the exercise of ordinary care, caution, and maritime skill. On the question of nuisance, the defence was that the Company were unavoidably prevented using a process by reason of the nuisance they made, for which they could be prosecuted. They complained of certain proceedings taken before Mr. D'Eyncourt, under the Public Health Act, 1891, section 21. But under that section, if the defendants showed they used the best practicable means for abating nuisance or preventing or counteracting any effluvia, then there was no nuisance; and if there was no nuisance, then there was no "unavoidable cause" such as the learned Counsel had contended for here. There was no conviction in that case.

Mr. BAGGALLAY: Then you go so far as to say, they have never caused a nuisance. You prosecuted them and failed?

Mr. DOWN: That is so. By agreement with the Company, they paid £60 of the costs.

Mr. BAGGALLAY: It is marked in the Court book that "the case was withdrawn on the payment of £60 costs." Then you can hardly say you failed.

Mr. DOWN said he did not say the Company did not create a nuisance; but he supposed they were able to prove that they had used "the best practicable means," which enabled them to escape the penalty under that section.

Mr. AVORY observed that he thought the Magistrate in that case believed the Company had used the best practicable means for abating

the nuisance. Then he would not convict. But this did not show there was no nuisance. They might use the best practicable means, and yet not abate a nuisance.

Mr. *W. J. A. Butterfield* was then examined by Mr. DOWN. He stated that he was formerly Chemist at the Beckton Gas-Works of the Gaslight and Coke Company, and was now Secretary to the Metropolitan Gas Referees. But he did not attend there as their Secretary, or in any official capacity, but simply as an expert. The Referees had no jurisdiction in regard to this Company. There were three, or possibly he might say four, known processes for reducing the sulphur impurity in gas. The most economical and most general was the lime process, which was worked, with one or two slightly varying modifications, at all gas-works where it was necessary to reduce the sulphur below 20 grains. By the exercise of reasonable care in the use of lime in the purifiers, he was of opinion that all nuisance could be avoided. The prevention of nuisance solely depended upon the care and the particular manner in which the lime was used. There were two recognized methods of using lime in the purifiers, either of which led to the avoidance of nuisance. There was the Beckton system, which necessitated the use of purifiers of somewhat large area relatively to the volume of gas to be dealt with. This system was used at Beckton and some other large works, where ample purifying area was provided. The system which generally prevailed at smaller works, and particularly at works where the area of the purifiers was cramped, was known as the rotation system; and the essential condition of obtaining an innocuous spent material under that system was for a certain proportion of air—about 1 per cent. of the volume of the gas—to be admitted to the purifiers. The effect of the air was to convert the sulphide of lime, which, on exposure to the air, would become offensive by the evolution of sulphuretted hydrogen—the sulphuretted hydrogen was evolved in the purifiers instead of in the open air afterwards. This method, he was of opinion, led to the production of an innocuous spent material. The system was suitable where the purifying area was small. But the Beckton system had helped to some economy, apart from the extra capital expenditure on the larger vessels required. Further, any nuisance or annoyance from the exposure of the spent material when the purifiers were opened might be avoided, or at least greatly minimized, by certain precautions which could easily be taken. The nuisance was largely due to the scattering of fine particles of the material, and to a small extent to sulphuretted hydrogen. The latter, however, might be avoided by the admission of air as he had mentioned. The dissemination of the dust might be clearly reduced by putting up screens on the windward side of the purifier about to be emptied. It might further, if the material (as was more often the case than not) was dry, be reduced by sprinkling it over with water, and by covering up all the loaded waggons or heaps of materials with sail-cloth or tarpaulin. Further, if the purifiers were so disposed and arranged to avoid as far as possible any nuisance arising from the discharge of material, very little offence would be produced. He meant, by the provision of holes in the bottoms of the purifiers, that the material could be discharged direct into trucks. This, of course, would necessitate the purifiers being raised on a floor above the ground-level. Flexible shoots, too, might be attached to the openings, so as to lead the material direct into the trucks with as little disturbance as possible. The ordinary precautions to which he had referred would not entail an expenditure of more than $\frac{1}{10}$d. per 1000 cubic feet of gas. The capital expenditure on a purifier-house arranged in the manner he had suggested on the first floor, might entail rather a heavier sum for interest charges. The lime process, with one or other of these modifications, was in use at all the gas-works of the three large Metropolitan Companies, and had been for many years. Asked to name any works of the Gaslight and Coke Company situated in purely residential districts where the lime process was in use, the witness mentioned Kensal Green, Fulham, Shoreditch, Haggerston, and Nine Elms; but Nine Elms, he added, could scarcely be called a residential district. Perhaps a better way to put it would be to say there were some eight works of the Gaslight and Coke Company in crowded districts where lime was used, three or four works of the South Metropolitan Company, and two works of the Commercial Company. In regard to nuisance, taking the Gaslight and Coke Company, he had no knowledge of their having ever been prosecuted for nuisance due to the carrying on of lime purification. He had made a careful search through the technical journals of the last twelve years, and had not been able to trace any prosecution of either of the three companies due to the carrying on of the lime process. They had been prosecuted for nuisance over one or two other processes carried on at their works. To sum up, if an offence had been caused in this case, then the process had been carelessly or improperly worked. Asked to describe other processes by means of which the sulphur could be reduced below 20 or 30 grains per 100 cubic feet, witness said the first means of getting the sulphur below these limits, which he would suggest, as a temporary expedient at any rate, if the lime process became impracticable, would be the selection of suitable coal—coal containing only a limited amount of sulphur, and at the same time the use of oxide of iron purifiers, which had no effect on the sulphur compounds *per se*. Some very valuable tests of English coal were made recently at the Berlin Municipal Gas-Works. An exhaustive examination was made of 37 different varieties of English coal; and one-third of these yielded gas which, when purified with oxide of iron, contained less than 30 grains of sulphur per 100 cubic feet. One-sixth of the varieties reported upon yielded gas containing less than 20 grains of sulphur per 100 cubic feet. This proportion indicated the extent to which the market would be curtailed if the buyer of coal had to limit himself to descriptions that would give gas (say) relatively free from sulphur. His opinion was that, if a buyer's market were restricted to the varieties of coal that yielded gas with an average of not more than 20 grains of sulphur per 100 cubic feet, he would have to pay 1s. per ton more for his coal, or 1d. per 1000 cubic feet of gas made. It might add that to the cost. For coal yielding gas that came within the 30-grain limit, about 6d. per ton might be added to the cost, or about $\frac{1}{2}$d. per 1000 cubic feet. In Berlin, they reduced the sulphur by the oxide process only; and in the report issued for the year ending March 31 last, the sulphur was reduced, on the average, to 16·1 grains per 100 cubic feet of gas supplied from the municipal gas-works. An alternative method was the adding of lime to the coal which was about to be put into the retorts. This process was tried at many gas-works some years ago—between 1884 and 1890—but it failed to succeed generally, on the score of economy. The use of lime in the purifiers was cheaper. But the evidence from all the works where it was tried was that it succeeded in reducing the sulphur compounds in the gas below 20 grains per 100 cubic feet of gas. It succeeded, although at greater cost. But its primary object was not to reduce the sulphur compounds; it was used to reduce the sulphuretted hydrogen also. It succeeded, however, in reducing the sulphuretted hydrogen only to a limited extent. The economy of the method would be greatly assisted by the modern facilities (which had been introduced since) for handling the materials. He did not know whether the process was now used; it might be. But in 1900, he saw it in use at the Folkestone Gas-Works. One great objection raised to it at the time was that it injured the quality of the coke. But the only possible source of nuisance from it would be the rather greater evolution of sulphuretted hydrogen if the coke was quenched in the ordinary manner. This would be evolved in the retort-house; but it would only slightly increase the amount usually evolved. The fourth process for the reduction of the sulphur was by the ammonia produced from the liquor of gas-works. This process, he should like to say, he would not advocate as a temporary expedient. It entailed considerable expense on plant; but it was feasible so far as reducing the sulphur compounds of the gas was concerned. It failed at the works in which it was tried, on the score of economy; it failed to accomplish the primary object for which it was introduced, which was not the removal of the sulphur compounds. An early process, not embodying the modifications requisite for the removal of the sulphur compounds, was tried at the Old Kent Road works of the South Metropolitan Gas Company. That was known as the Hills process; the later one was known as the Claus process. It was to replace both lime and oxide as purifying materials; and it failed to do that. If it were used in conjunction with lime or oxide, with special modifications, he was of opinion it would readily become adaptable to removing sulphur compounds economically. That had not been tried; he saw no reason as a chemist why it should not succeed. There was a direct saving due to not having to handle the lime; a saving of capital on the additional purifiers required for the lime process. Even supposing the purifiers were not economically constructed, the labour was cheap, and the whole process was economically carried out; and the saving could not be less than $\frac{1}{2}$d. or $\frac{3}{4}$d. per 1000 cubic feet. But there was further an indirect saving equivalent to $\frac{1}{4}$d. per 1000 cubic feet by not using lime for purification, for a constituent of the gas which is removed by lime—carbonic acid—was left in it. The volume of this constituent is about 12 volumes per 1000 cubic feet; so that, whereas with gas purified by lime, the gas company would only have 1000 cubic feet to sell, when they abolished lime purification, they had approximately 1012 cubic feet to sell. This represented, at London prices, approximately $\frac{1}{4}$d. This added to the direct saving made a total saving not far short of 1d. per 1000 cubic feet.

Mr. AVORY pointed out that not a word of this was put to Sir George Livesey in cross-examination; if so, he (learned Counsel) could have ascertained what his views on the subject were. He had to cross-examine witness on new points; and only one of them—the coal question—was put to Sir George. He did not recollect that a word was said about any other process, with the exception of the ammonia one; not a word as to the way in which the purification by lime was carried on, which this gentleman had said was improperly done. The position in which he was placed was that he was not entitled to call any evidence himself, and yet he had to cross-examine witness on questions which were never put to his witnesses. The most important of all was that of how nuisance might be avoided by the very lime process which had been in use in this Company's works if certain precautions were taken, or certain means were adopted.

Mr. BAGGALLAY: It did not occur to me that there was any serious question on Sir George Livesey's evidence so far as it went. The point that Mr. Down cross-examined on was with regard to the use of any other coal.

Mr. DOWN said he referred to the ammonia process, and asked Sir George whether there was any other process.

Mr. AVORY remarked that it was never suggested to Sir George that the mixing of lime with coal before putting into the retort would obviate all nuisance; nor was it suggested to him that if air, as witness had contended, was introduced into the purifiers in a certain proportion, it would make any difference. He therefore asked for permission to recall Sir George, or to call other evidence.

Mr. BAGGALLAY thought Mr. Avory could have an adjournment for the purpose of getting up his cross-examination.

Mr. AVORY said he would be quite content to go on with the cross-examination if he could call other evidence. It was a curious way of conducting this case. No evidence was called in support of there being any other processes; and he called a witness to show whether there were any other processes.

Mr. DOWN: And I asked him.

Mr. AVORY: And he said "No."

Witness was then cross-examined by Mr. AVORY. He acknowledged that he was not called to give evidence before the Board of Trade Committee, but that his late chief Mr. Trewby was. (The learned Counsel read an extract from the Committee's report as to there being no doubt in regard to there being a nuisance in connection with the lime process.) Witness admitted there was "nuisance" to the workmen, and that there was nuisance to the neighbourhood, in so far as there was nuisance from almost all gas-works processes. Asked whether this was not a modification of what Counsel understood was witness's opinion, and that, even with his perfection of processes, there was annoyance to the neighbourhood, reply was given in the affirmative. The inquiry was also made as to whether witness advocated for the South Suburban Company the rotation system. He said he only took that as being capable of being put into use at once without attention to the purifiers. He believed that formerly the Company were using the rotation system; but he did not know it was being used

with the precautions he had suggested. He contended that, if they were using it with these precautions, there would have been no nuisance. They were the precautions which precluded the nuisance. At Beckton, they had in use the alternative system of which he had spoken as the "Beckton" system; and that *per se*, without the adoption of other precautions, rendered the lime innocuous.

Mr. AVORY: Was the system worked at Beckton one which avoided nuisance?

Witness: All actionable nuisance.

You mean "actionable," so long as you are outside Lewisham?—No; certainly it was disagreeable, in so far as many gas-works processes are.

Mr. AVORY here read the paragraph from Mr. Trewby's evidence before the Board of Trade Committee, in which he said that at gas-works sulphur purification was a matter of considerable nuisance; that the material was difficult to dispose of; that the supervision of the system occupied an undue proportion of the time of, and was a source of great anxiety to, the staff, who could be more usefully employed in cheapening the manufacture of the gas; and that at intown stations it was impossible at all times to avoid nuisance in the localities of the works.

Witness agreed with that. But he would not call the South Suburban Company's works an intown station, as he should several of those of the Gaslight and Coke Company. Although surrounded by residential property on three sides, he should not speak of the works as intown ones in the sense that Mr. Trewby was speaking of intown stations.

Mr. BAGGALLAY (to Mr. Avory): Practically you rely upon the report of the Board of Trade Committee, which you have no right to rely upon.

Mr. AVORY: The Committee's report may show that it is an "unavoidable cause." I am quite content if it strengthens my case.

Mr. BAGGALLAY: What you have to prove here is that you have no other process, no other means, but this lime, which you say creates such a nuisance that you are liable to actions.

Mr. AVORY: That is why I use the Board of Trade Committee's report; because it recognizes that fact.

Mr. BAGGALLAY: I cannot pay much attention to the report. I must deal with the law as in the Act of Parliament. You must show "unavoidable cause."

Mr. AVORY: Mr. Trewby also said "when an efficient sulphide vessel has been obtained, its continuously satisfactory action is also a matter of absolute uncertainty. The presence of any abnormal proportion of carbonic acid in the crude gas will quickly destroy the sulphide material used for the extraction of sulphur compounds, while a sudden change of temperature will frequently cause sulphide purifiers which have previously worked quite well to evolve sulphur impurities in large quantities."

Witness said he agreed with that, except that he would alter the "absolute" to "a matter of some uncertainty." It was merely that gas-works officials had a troublesome process to deal with; and they wanted ample purifier area. Asked whether he agreed with the next passage: "The particular cause of anxiety with regard to the process of purification from sulphur compounds is that, while there seems to be no rule for the sudden failure of a sulphide purifier in its action of properly performing its function, the remedy of making a new one is a matter of days at the best, and the general output of gas can only during such time be kept within the prescribed limit by other streams of gas containing amounts of sulphur impurities well below the limit. Should one or more of these rise, the difficulty of effectually controlling this impurity is then great." Witness replied that there was good basis for that statement; but he did not agree with it in its entirety. He thought it was slightly exaggerated.

Mr. AVORY: I never knew two experts who did agree.

Cross-examination continued: Regarding the Berlin coal experiments, he quoted them because he knew very few, if any, English experiments that were so exhaustive on these points. Inquiry was made as to whether these were not purely chemical experiments, to which witness replied that they were made in two full-sized retorts. As to the third process, of mixing lime with coal before being put into the retorts, he had not knowledge that it was introduced a century ago (1806); but he had some recollection of the patent now that it was mentioned. Substantially, however, the process under modern working conditions was introduced about 1884. The only place where he knew it was in practical operation in 1900 was Folkestone; but he could not say whether or not they had any sulphur restrictions there. Where used, there would be a very slight increased nuisance in quenching the coke. Approximately the sulphuretted hydrogen evolved into the air was double. The quantity was very small to start with; so that double the quantity did not amount to much. As to the fourth process—purifying by purified ammoniacal liquor, he did not know what the effect on the sulphur compounds had been at Halifax. He was, however, prepared to take it that there had been a loss on the gas-works there of £13,197. He had already stated that the process was not economical as a whole. He was not prepared to say the use of the purified ammoniacal liquor at Halifax had no effect at all on the sulphur compounds; but he thought the Halifax experiments were unsatisfactory in that respect. They were satisfactory at Birmingham, but not at Halifax. The primary object of the process, as used both at Halifax and Birmingham, was not the extraction of the sulphur compounds. He was aware that at Birmingham the sulphur clauses were repealed as far back as 1883.

Re-examined: He could not say for certain that, although there were no restrictions at Birmingham, they did as a matter of fact purify for sulphur compounds. He could not name a number of gas-works under no restrictions, and yet at which tests for sulphur were made. What he did know was that until recently lime purification for the extraction of sulphur compounds was carried out at Croydon, where he understood there were no sulphur restrictions. The chief source of trouble to the workmen engaged in lime purification was the dust flying into their eyes; but this could be avoided by the use of dark or wire spectacles. Regarding the emission of sulphuretted hydrogen when quenching coke where the coal-liming process was used, it could be avoided by allowing the coke to cool in closed vessels. This method was occasionally used in place of quenching. Under ordinary conditions, the sulphuretted hydrogen only got a very little way from the gas-works before it was oxidized by the oxygen of the air.

Dr. *A. W. Harris*, Medical Officer of Health for Lewisham, said he was formerly for twelve years Medical Officer of Health at Southampton. During his term of office at the latter place, he paid repeated visits to the gas-works there. They were limited to 20 grains of sulphur per 100 cubic feet. The purification process was by lime, with a small percentage of air. There was never any complaint of nuisance, nor were any proceedings taken against the Company in respect of nuisance, with one exception, when there was an accumulation of lime between two contracts. The sulphur was reduced to 10 grains per 100 cubic feet. He considered that gas containing 30 grains and over of sulphur was more deleterious to the public health than gas containing 10 grains; and any proportionate increase of sulphur over the usual amount was most serious as the quantity increased, owing to the production of sulphurous acid and sulphuric acid.

Mr. DOWN: May I get from this witness that the Lewisham and other Local Authorities are going to strenuously oppose the Company's Bill?

Mr. BAGGALLAY: What does it matter to me?

Cross-examined: He gave evidence in a former case that the Company were creating a nuisance at their works, by the deposit of lime. This was caused by the Company emptying a number of purifiers at a time, instead of one. This would affect the nuisance immensely. In that case, he believed the parties came to a settlement. Questions of public health could not, queried Mr. Avory, be settled by payment of costs unless there was some serious question about the results. Witness replied that it was assumed at the time it was more or less accidental. Further action was taken, which showed that what was complained of was a recurring nuisance. There had been serious complaints by inhabitants of offensive smells from the works.

In re-examination, witness appeared to possess the view that the nuisance was not occasioned by the process, but by the way in which it was conducted.

Mr. AVORY intimated that he should like to call Sir George Livesey.

Mr. BAGGALLAY replied that if there was any point that Mr. Avory wanted to give evidence upon, now was the time.

Mr. *Charles Hunt* (a Director of the Company) stated that for thirty years up to 1902, he was the Engineer to the gas-works at Birmingham, and before that was Assistant-Engineer to the London Gaslight Company, which was now amalgamated with the Gaslight and Coke Company. As to Mr. Butterfield's suggestion, that if certain precautions or measures were adopted in connection with the lime process of purification the sulphur compounds might be effectually removed without causing a nuisance in the neighbourhood, he (witness) was quite satisfied that was not so—even if every precaution was taken to avoid a nuisance. He believed that at the South Suburban Company's works everything that Mr. Butterfield suggested had been tried, excepting perhaps screening off each purifier. The purifiers were covered in, but they were open at the sides; that was the only difference so far as he could see. He thought this proposal of screening in would be a very objectionable and dangerous practice, because occasionally one was liable to escapes of gas from purifiers; and should there be a light in the neighbourhood, the effect in a confined space would be very serious. Therefore, they kept the purifiers as open as possible. There had actually been an explosion in connection with confined purifiers at Birmingham this last winter. Asked whether, in his experience, any of the other processes mentioned by Mr. Butterfield were effective for the purpose of reducing the sulphur compounds without causing a nuisance, witness replied that they were not effective for removing the sulphur compounds with any certainty, and therefore not effectual for the purpose.

Mr. BAGGALLAY: What is the extent of the uncertainty?

Witness replied that they might get a slight reduction on one day, and another day might get no reduction whatever. That was their experience at Birmingham with the ammonia process. There was no other process, excepting the ordinary lime one, by which the sulphur compounds could be brought down within the limit prescribed by the Act. As to the coal-liming process, that was a very old method; and it was first patented by Edward Heard in 1806. It had never obtained any general adoption.

Mr. AVORY: The only other method of lessening sulphur in the gas is that suggested of using coal containing less sulphur?

Mr. BAGGALLAY: On that point Sir George was distinctly cross-examined.

Cross-examined: The ammonia process did reduce the sulphur to the extent perhaps of 5 or 10 per cent. In the earlier days of the experiments at Birmingham, he was not of the same opinion. Twenty years ago—in 1886—he read a paper on the subject.

Mr. DOWN: In that paper you said that the bisulphide of carbon was reduced by 50 to 70 per cent. by this process.

Witness: Occasionally.

You said nothing about "occasionally" in the paper?—It was found subsequently that we could not rely upon the process, and then it was discontinued.

Cross-examination continued: As to the explosion at Birmingham, there was a Coroner's inquest on the three men who were killed; but he was not present. Questioned as to whether the explosion was due to screening or some other cause, he said he was referring to this as an example of the enclosure of purifiers which screening would effect. The purifiers were in an enclosed house, with a roof.

Mr. DOWN: I take it that the explosive gases are confined more by the roof than by the sides?

Witness: More by the sides than the roof, because it is found where we cover in purifiers and leave the sides open, there is no danger. The object of roofing in is to cover and protect the purifiers, and to enable the men to work at them in all weathers.

At Birmingham, were the purifiers screened on one side only?—On four sides.

Assuming you had a screen only on the windward side, what chance would there then be of an explosion?—That would depend on the way of the wind.

Cannot you shift your screen?—It would be impracticable.

Shifting a canvas screen?—I never heard of it being done.

By Mr. BAGGALLAY: Between 1902, when the Company were summoned for creating a nuisance, and July last, when they discontinued the lime process, every effort was made to reduce the nuisance. But the inhabitants around continued to complain. As to the coal used, they selected it very carefully. The coal was changed practically every year. He did not know of any coal that would be successful permanently in yielding a smaller amount of sulphur; and to put such an idea into force would restrict their choice of coal very considerably. The Directors had not specially considered what the cost would be to use a less sulphurous coal; but they tried to get prices for coal as widely as they could, and then considered the merits of each. The point had been considered as to whether they could avoid the sulphur by buying perhaps a more expensive but less sulphurous coal; and the result was that there would not be a sufficient choice. What Mr. Butterfield had said on the question of the extra cost was not correct so far as he knew. Regarding the saving by the abolition of the lime process, it had not yet been stated what they would save; but what they expected to save was, he thought, merely a fraction of a penny per 1000 cubic feet. He was speaking from memory; and the change had not been made long enough to settle that question.

Mr. BAGGALLAY, in giving his decision, said the proceedings were taken by the Borough Council because it was their duty to take them. They were required by Act of Parliament to test the gas, and prosecute if they found the Company did not fulfil the requirements of the Act. In this case, the test was made; and the sulphur was found in excess of that which the Act of Parliament allowed. The answer on behalf of the Company was that it was an "unavoidable cause;" and they were unable, he supposed, to reduce the sulphur. They said the "unavoidable cause" was this: In order to reduce the sulphur below the limit, the only known process was the lime process. But by this they created a nuisance for which they were liable to prosecution. This would be a defence if they could show that the lime process was the only possible way of doing it, and that it created a nuisance for which they were liable at law. That would be a defence. But, in his opinion, they failed to prove that this was the only way the sulphur could be brought down to 20 or 30 grains on one day. There were other modes of doing it; and there were modes of even using the lime process by which they could avoid the nuisance for which they would be liable to criminal proceedings. He therefore found in this case they had failed to prove such "unavoidable cause" as would be a defence in this prosecution. He must therefore inflict a fine of £10 and costs.

After a little discussion, Mr. Baggallay fixed the costs at 25 guineas.

[It is understood that the Company will appeal.]

The Charges against a Gas Company's Secretary.

At the Central Criminal Court on Saturday, before Mr. Lumley Smith, K.C., George Thomas Verney surrendered to his bail upon indictments charging him with having committed wilful and corrupt perjury in an affidavit, and for having, either as a public officer or as trustee, converted to his own use several sums of money (see *ante*, p. 238). He pleaded "Guilty" to the perjury charge, but "Not guilty" to the other. Mr. Charles Mathews and Mr. Arthur Gill prosecuted; Mr. R. D. Muir appeared for the defendant. The charge of converting money to his own use was not proceeded with. The whole had, however, been repaid, and the accused said he had used the money simply to tide over temporary financial difficulties. Mr. Muir submitted that accused had no intention to defraud. His object was only to borrow the money temporarily, he having embarked in a concern which had great expectations. He was sentenced to three months' imprisonment, without hard labour, in the second division.

MISCELLANEOUS NEWS.

COMMERCIAL GAS COMPANY.

The Half-Yearly Report and Accounts.

In the report which the Directors of the Commercial Company will present to the proprietors at the half-yearly meeting on Thursday, they state that the revenue account for the six months ending the 31st of December shows a net profit of £53,511 10s. 10d., which, added to the balance of £24,116 16s. 9d. brought forward, produces a net revenue balance of £77,628 7s. 7d. Deducting therefrom £8271 9s. 4d. for interest, there remains standing to the credit of the net revenue account a balance of £69,356 18s. 3d. available for distribution. They recommend the payment of dividends thereout at the rates of £5 4s. per cent. per annum upon the 4 per cent. stock, and of £5 per cent. per annum upon the 3½ per cent. stock, both less income-tax. The Directors announce with great regret the resignation by Sir George Livesey of his seat at the Board, and the election of Mr. Roland Yorke Bevan to fill the vacancy. A Bill in Parliament to amend the Acts relating to the Gaslight and Coke, South Metropolitan, and Commercial Gas Companies with regard to the testing for gas, procedure for forfeitures, and otherwise, has been deposited, and will be submitted for the approval of the proprietors at an extraordinary meeting.

The accounts accompanying the report consist of the usual statements. They show that the paid-up stock on the 31st of December amounted to £883,125; that £1,076,875 had been added on conversion, making £1,960,000; and that £272,290 10s. (including premiums) was unissued out of the £2,235,000 authorized. The total amount borrowed on the above-named date was £314,062 10s., and £135,937 10s. was added on conversion; making a total of £450,000, and leaving £100,000 to be borrowed out of the £550,000 authorized. The receipts on capital account amount, with premiums, to £2,462,298 17s. 11d.; the expenditure stands at £1,298,941 15s. 4d., with a nominal amount of £1,212,812 10s. added on conversion—together, £2,511,754 5s. 4d. There is consequently a balance of £49,455 7s. 5d. carried to the balance-sheet. The expenditure on capital account in the half year was £38,595, apportioned as follows: New steamships, £6499; buildings, plant, &c., £6708; mains, services, &c., £4228; meters, £292; stoves, £6236; prepayment meters and fittings, £14,632. The reserve fund amounted on Dec. 31 to £31,557; and the insurance fund to £30,361. The following is the revenue account:—

Expenditure.

Manufacture of gas—			
Coals and oil, including dues, carriage, unloading, and trimming	£85,627 17 3		
Salaries of Engineer and officers at works	1,651 13 4		
Wages (carbonizing)	18,083 16 3		
Purification—including £2584 6s. 4d. for labour	5,271 3 5		
Repair and maintenance of works and plant, materials, and labour, less £326 8s. 8d. received for old materials	31,566 12 2		
		£142,201 2 5	
Profit sharing		2,948 16 9	
Distribution of gas—			
Salaries and wages of officers and rental clerks	£3,131 9 4		
Repair, maintenance, and renewal of mains and services, material, and labour	4,121 4 5		
Repair and renewal of meters	2,175 7 4		
" " " " stoves	4,138 0 4		
" " " " prepayment meters and fittings	5,291 17 10		
Incandescent mantle maintenance	1,075 18 3		
		19,933 17 6	
Public lamps—lighting and repairing		3,211 16 3	
Rent, rates, and taxes		9,434 9 1	
Management—			
Directors' allowance	£1,250 0 0		
Company's Auditors	75 0 0		
Salaries of Secretary, Accountant, and clerks	1,104 0 10		
Collectors' salaries and commission	1,610 9 5		
Prepayment meter collection	1,269 17 10		
Stationery and printing	858 5 2		
General charges	1,142 10 7		
		7,310 3 10	
Bad debts		1,271 13 1	
Law and parliamentary charges		217 14 6	
Superannuations and allowances		1,457 18 10	
Official officers		123 10 11	
Total expenditure		£188,131 3 2	
Balance carried to net revenue account		53,511 10 10	
		£241,642 14 0	

Receipts.

Sale of gas—			
Common gas per meter at 2s. 5d. (61,119)	£171,674 1 3		
Public lighting and under contracts, common gas	7,046 18 7		
	£178,720 19 10		
Less discounts and allowances	2,844 0 3		
		£175,876 19 7	
Rental—			
Meters (24,061)	£2,851 0 1		
Stoves (29,949)	4,829 10 3		
Prepayment meters (36,000)	8,017 17 1		
Incandescent mantle maintenance	640 17 5		
		16,339 4 10	
Residual products—			
Coke, less £4678 8s. 8d. for labour	£30,017 19 8		
Breeze, less £647 3s. 2d. for labour	2,420 2 6		
Tar	6,496 6 8		
Ammoniacal liquor and sulphate of ammonia	10,281 2 9		
		49,215 11 7	
Miscellaneous receipts—			
Rent receivable	£180 15 6		
Transfer fees	30 2 6		
		210 18 0	
Total receipts		£241,642 14 0	

The following are the statements relating to the manufacturing operations of the Company in the half year:—

Statement of Coals and Oil.

Description.	In Store June 30, 1904.	Received During Half Year.	Carbonized During Half Year.	Used and Sold During Half Year.	In Store Dec. 31, 1904.
	Tons.	Tons. cwt.	Tons. cwt.	Tons.	Tons.
Common	32,018	97,516 10	104,225 10	728	24,581
Cannel	2,508	..	..	..	2,508
Total	34,526	97,516 10	104,225 10	728	27,089
Oil—gallons	132,084	1,442,109	1,343,954	..	230,239

Statement of Residual Products.

Description.	In Store June 30, 1904.	Made During Half Year.	Used During Half Year.	Sold During Half Year.	In Store Dec. 31, 1904.
Coke—tons	7,466	63,838	15,559	47,295	8,450
Breeze—tons	127	12,521	..	12,431	217
Tar—gallons	744,593	1,177,979	..	1,225,984	696,588
Ammoniacal liquor—butts	2,422	33,875	31,167	..	5,130
Sulphate of ammonia—tons	35	989	..	814	210

Statement of Gas Made, Sold, &c.

Quantity Made (meter register and estimated).	Quantity Sold.		Tota Quantity Accounted for.	Number of Public Lights.
	Public Lights and under Contracts (estimated).	Private Lights, per Meter.		
Thousands.	Thousands.	Thousands.	Thousands.	
1,590,447	35,999	1,425,973	1,485,828	4134

SOUTH METROPOLITAN GAS COMPANY.

The Ordinary Half-Yearly General Meeting of this Company was held at the Cannon Street Hotel, E.C., last Wednesday—Sir GEORGE LIVESEY in the chair.

The SECRETARY (Mr. Frank Bush) read the advertisement convening the meeting, and the minutes of the last half-yearly meeting. The seal of the Company was affixed to the Register of Proprietors; and the report and accounts given in the "JOURNAL" for the 31st ult., were presented.

The CHAIRMAN: Ladies and gentlemen, I have now to move—"That the report and accounts now presented be received and adopted, and the report entered on the minutes." I presume the report, as usual, will be taken as read. I shall have to confine my remarks somewhat, because we have rather a long piece of business in reference to the two Bills which will be brought before us at the Wharncliffe Meeting to follow this one. We endeavour to make our report as full and as explanatory as possible of the position of the Company; and therefore it is hardly necessary to enlarge very much upon it. But there are certain points which perhaps need a few remarks from me.

THE POSITION OF THE COMPANY.

To begin with, I must say that we have not earned sufficient profit to pay the full dividend to which we are entitled. We reduced the price of gas 2d. per 1000 cubic feet the preceding Christmas; but in June last with that 2d. reduction we had a very good half year, and sufficient surplus to warrant us reducing the price further. In fact, at the time there was apparently no option before us but to reduce it, because we had a very considerable undivided balance, and we thought we saw our way to give the consumers another 1d. We do not regret it. Residuals have not turned out so well as we expected; and the increase in business has not been so much as usual. But I am bound to say it is as much as we could have expected; and I will tell you why. We give in the second paragraph a statement of the additional consumers we have supplied in the year; that is, we are comparing with the corresponding half of the previous year. On the 31st of last December we had 1063 more additional ordinary customers, 17,055 additional slot-meter consumers, 3654 additional cooking-stoves to ordinary consumers, 18,865 additional cooking-stoves to slot-meter consumers, and a considerable number of gas-engines, gas-fires, &c. I have made a rough calculation as to what this extra business ought to bring us in; and I think I am not overstating it when I say that these additional customers would consume in the half year something like 270 million cubic feet of gas. We have only had an increase of 170 millions; therefore there is a deficiency of 100 millions somewhere.

EFFECT OF THE INCANDESCENT MANTLE.

Now, this is due to the ordinary consumers; but, ladies and gentlemen, do not run away with the idea that we have lost these consumers, for we have not. We have more ordinary consumers than we had a year ago, by 1000. Our gas has not been supplanted by any rival light—of that I am quite sure—to account for the 100 million cubic feet reduction in consumption by the ordinary consumers. I believe it is more than fully accounted for—in fact, I should have expected a greater reduction than that—by the adoption of the incandescent mantle. In one of our workshops, the other day, they made a test by trying the best flat-flame burner and then the incandescent mantle; and they found the consumption of gas with the mantle was only one-third what it was with the flat-flame burner, while the light was greatly superior. There is no doubt whatever that the incandescent mantle is being very largely adopted; in fact, we have 45 men doing nothing else but attending consumers to maintain their mantles in working order. A great number of the consumers are now learning to manage the business themselves. From returns that we have got from certain large consumers who have adopted the mantle, on comparing the consumption of one quarter with the corresponding quarter before they adopted it, we find a reduction, on an average, of 37 per cent. in the consumption of gas. The wonder always is to all of us that, with the largely extended use of incandescent mantles, we have any increase at all; and I think, ladies and gentlemen, you may take this as some real comfort and assurance that gas is more than holding its own. But we are a long way behind Germany. I was reading the other day the report of the meeting of the Imperial Continental Gas Association in November last. The Directors had paid a visit to Berlin, and had tried to find a flat-flame burner in the city; but they could not until at last they found one in their own works. Our Engineer, Mr. Carpenter, said if the incandescent system is the right one, it ought to be used in our works; and he has got the Engineers at the different stations to adopt mantles all over their works. I was astonished the other day, in going into the coke floor of a retort-house, to find the incandescent mantles there; and I think if they will stand there, that they will do anywhere.

THE DIVIDEND AND THE PRICE OF GAS.

Therefore you may take it that, although the consumption of gas in this way is diminishing to some extent, the reduction is very trifling, and will be made up in a short time when we get all our people supplied with mantles, because the business generally is increasing. But the present effect of it is that we have only 3 per cent., or rather less than 3 per cent. increase, in the half year; and our revenue is less than we require to pay the full dividend. There is one mistake in the third paragraph of the report. In the notice of our Company in "The 'Times' Weekly Financial Supplement," I saw it was said that the reduction of 3d. saved the consumer £74,000 a year. They were quite right to make this statement, because it is a quotation from the report; but the report is wrong. It is £74,000 in the half year. The 3d. less at which we are supplying gas benefited the consumers to the extent of rather more than £74,000 in the half year to December. By various savings made, the actual reduction is £53,000; but in the six months to December, 1903, we had a considerable surplus, whereas in the half year under review we have a deficiency of £28,000, which, taken from the undivided balance, will leave £37,000 to carry forward. As the June half year is always rather better than the December half, we have no anticipation of the necessity of raising the price above 2s. I can assure you we shall keep it down to the 2s. as long as it is possible; and I think, unless something very unforeseen happens, that will be the figure for a long time to come—or a lower figure, but not a higher one.

THE GAS COMPANIES AND THE COUNTY COUNCIL.

There are other matters to which I wish to refer in moving the adoption of the report. I shall leave the fourth and fifth paragraphs, because they refer to the two Bills that have to be submitted to you at the Wharncliffe Meeting; but I think I may say something about the sixth paragraph, in which reference is made to the London County Council. We have been informed that the Council are willing to confer with the Gas Companies with a view to the settlement of the legislation. Well, this statement we hail with great pleasure, because it is a move in the right direction, and one which has our thorough sympathy. We are willing, and always have been—for we have made many attempts since the Council came into existence—to work together with them. Mr. Bush and I have had interviews with their Chairmen and others in years gone by; but somehow or another we have been unable to convince them that we are public servants doing our duty to the public, just as much and just as well as they. I am quite sure we are as anxious as they can be to serve the consumers well.

GAS AND ITS COMPETITORS.

This takes me back to an expression in the first paragraph. We say there that the low price of gas makes us secure in the free competition for light and heat to which gas is subject. The words "free competition" are what I wish to refer to. When this restrictive gas legislation was introduced more than forty years ago (because it dates from 1860), the gas companies had an absolute monopoly. There was no competition. They divided London, and the county towns too, so that there was only one company supplying one district; and, moreover, there was no competing artificial light. Parliament, therefore, thought it necessary to impose restrictions in the interests of the public. Now the conditions are entirely changed. Then there was no competition of any kind whatever—no competition between the companies and none of any other light. Now, though it is true there is no competition between the companies, there is the competition of alternative means of lighting. One of the greatest competitors gas ever had was petroleum oil or spirit, which has tended very largely to supplant gas or to prevent its use. Then there was the electric light. People who do not like gas now have the electric light or petroleum spirit, or, as I saw in an advertisement in "The Times" the other day of Price's Candle Company, "the best light of all is candles." (Laughter.) Certainly candles are very much improved upon what they were in the old days. We are exposed to free competition; and what we ask is that we should be free to meet it, and not have our hands tied as they have been and are tied. There is no restriction on the supply of electric light; there is no testing of it. Electric lighting companies can talk about their 16-candle lamps, and there is no testing as to the strength of the current or anything else. But here we gas companies are hampered and restricted by the "red-tape" of a generation which does not apply to the present circumstances; and your Directors are prepared to declare, and do declare, that the free competition which now exists is the best safeguard the public can have. It is to competition we owe all progress and all improvement; and I think it may be said that the competition with us induces us to adopt every means to reduce the price of gas, and to supply the public with an article that satisfies them.

GASEOUS FUEL AND SMOKE PREVENTION.

Then there is another thing. The low price of gas also tends to bring gas more and more into vogue as fuel. A great deal of fuss is made about smoke abatement in connection with factory chimneys. But that causes very little of the smoke of London. It is mainly caused by the millions of domestic chimneys; and I think we may claim that by the use of gas for cooking and heating—the Company have now 216,000 or 217,000 gas-stoves on hire, and taking in addition those that are owned by the consumers, which amount to a considerable number—there is a large quantity of smoke prevented. In many cases fires have been superseded by gas-stoves for cooking. I believe gas has a still greater future before it when it can be made cheaper as a fuel; and I think we must look to gaseous fuel more than to anything else for the abatement of smoke.

THE BILL OF THE COUNTY COUNCIL.

Now, the London County Council have introduced a Bill. The Bill corresponds, in many respects, with that of the united Companies for carrying out the recommendations of the Departmental Committee of the Board of Trade. There are one or two points in which the Companies do not agree with the recommendations or with the Council's Bill. For instance, in clause 6 they want to alter the system of testing the gas. The gas supplied by the Commercial and South Metropolitan Companies has been fixed by Parliament to be of a quality of 14 candles; and it is to be tested in a burner in the way the consumer would burn it, as he does burn it if he uses an argand burner, to get the best light. But the County Council, misled, as I believe—though they had the idea before—by the Departmental Committee, say: "No; this gas for testing is not to be burnt as the consumer would burn it, but in a different way. It is to be burnt at a fixed rate per hour, and that fixed rate will make 14-candle gas appear as 13 or less. It causes gas to be overburnt, to have too much air." In fact, by the London County

Council Bill, our gas, which gives the consumer a light equal to 14 candles, in the way he uses it, is to be tested in a manner which will make it appear as of only 13 candles. Well, we object to that. Then, in the next clause, they propose that tests be made for the calorific power of the gas. We have no objection to the Council making these useless tests, but they ought to be made at their expense, and not at ours. The Company, according to the Bill, are to provide all the apparatus, and to pay the cost of these tests. Then the Departmental Committee have recommended that lime be abolished for purification, and therefore tests for sulphur compounds, as they are called, are no longer necessary. The Departmental Committee have recommended that lime, which is a decided nuisance in the neighbourhood of gas-works where it is used for purification, shall be abolished; and the County Council have accepted it. But in their Bill they propose that tests be still made for these sulphur compounds. Very well. If they like to make the tests, we have no objection, only they ought to pay for them. The Departmental Committee recommended also that the illuminating power should be ascertained by means of a flat-flame burner to be prescribed by the Gas Referees. Well, of all the backward things that could have been suggested, I think this is about the worst. The flat-flame burner is going fast out of use. On the Continent, as I have already told you, it is hardly known; and in this country it is about the worst way in which gas can be used. It is the most extravagant of gas-lights. However, they may test with the flat-flame burner if they like; we do not mind, only they ought to pay the expense, and not ask us to. They say the flat-flame burner is to be prescribed by the Referees; but if they are to test with the flat-flame burner, I say the clause ought to run something like this: "The flat-flame burner shall be the best for the time being that can be produced to develop light in the gas." Then we should perhaps get improvements in the flat-flame burner. The argand burner was adopted as the best burner in about 1869. The flat-flame burner at that time was a most defective thing, giving in many cases not one-third of the light that could be obtained from the gas; but in the 35 years that have passed the flat-flame burner has been greatly improved, and instead of giving one-third of the light, the best form will give nearly as much light as the argand. But the argand has stood still; it was stereotyped by the Act of Parliament. There was no inducement to make an improvement in the argand; the thing was fixed, and improvement was stopped. Well, we say that there a great mistake was made. An important part of the Council's Bill is that they propose to reduce the initial price of the three Companies by 1d. This is a paltry thing. It is an unjust thing to propose. There was a great fight in the case of each of the Companies in the last five years—this Company in 1900, the Commercial in 1902, I think, and the Gaslight and Coke in 1903. The initial prices of the Companies were lowered; and it happens that they were reduced in each case by 5d. per 1000 cubic feet. But there were compensatory arrangements. The Commercial Company and ourselves gave up 2d. because of the reduction in illuminating power; and then, while the initial price was reduced, the rate of increment of dividend under the sliding-scale was increased from 2s. per cent. per penny to 2s. 8d. per cent. per penny. Now the County Council come in and say: "Reduce it another penny." Their idea was that the sliding-scale at present is not sufficiently operative, that the increment of dividend under it is too small to induce the Companies to make any great effort to reduce prices. The increment of dividend in the case of each of the Metropolitan Companies is 2s. 8d. per 1d. reduction. In the case of our Company, a reduction of 1d. means £49,000 given to the consumers, and the increase of dividend is just £8000, or 2s. 8d. per cent.; and the Accountant of the Council—a very able man—pointed out some years ago that this was not sufficient to induce the Companies to do their best to reduce the price. Well, I quite agree that if there were no other reasons for inducing them to reduce the price, this in itself would not be sufficient. The Departmental Committee adopted this view, and recommended that the initial price should be revised—that is, if the initial price is reduced, the increment of dividend per 1d. of reduction should be increased. But the County Council could not do this. They admitted that they could not do it for the Gaslight and Coke Company. I suppose they have admitted practically that they could not do it for the other two Companies. Therefore they propose a reduction of 1d. in the standard price of the three Companies. That would reduce the dividend payable by the Companies, at the price they now charge, by 2s. 8d. per cent.; and the Council, I suppose, think this would be an inducement to further reduce the price. Well, my answer to that is: We do not require any such inducement. We have a sufficient inducement in the competition to which we are exposed. If we are to maintain our business, we must reduce the price. I think this question of the reduction of the initial price will not be seriously contended for. At any rate, the Governor of the Gaslight and Coke Company—Sir William Makins—last Friday, and I to-day, and I am sure Mr. Bradshaw, of the Commercial Company, next week can give assurance that the Companies are thoroughly united in their opposition to any such act of injustice; and I believe we shall succeed.

THE CO-PARTNERSHIP SYSTEM.

There is only one other remark, ladies and gentlemen, and it is with reference to the seventh paragraph of the report: "The Directors have the pleasure to again bear testimony to the loyal support of their officers and workmen, resulting from their co-partnership system, which, beginning with simple profit-sharing fifteen years ago, has made some 5000, or very nearly all the employees of the Company, shareholders or partners in the business, with an aggregate holding, mainly in ordinary stock, of nearly a quarter of a million." You have had your share in this, just as much as the Directors and officers. We are all at one on this point; and we believe that, as far as we are concerned, we have solved the question. I was called as a witness before the Royal Commission on Trade Disputes, and one of the questions put to me was this: "Suppose the Trade Union Bill to give the Trade Unions *carte blanche* to do as they like practically, that is with regard to strikes—and not to be liable for damages—supposing that Bill were passed, what effect would it have on your Company?" I was bound to say: "None whatever." Nothing that Parliamentary Committees, Trade Unions, or anybody else, can do can interfere between us and our employees now. We have got past all of them, and that is worth a great deal. I think we are right in saying that "partnership is now fast becoming recognized as the sure and true settlement of the struggle between capital and labour." It has certainly settled it in our case. This remark is due to the great Italian patriot, Mazzini. In speaking of the labourer, he said: "The position of the labourer was originally that of the slave. He then rose from slavery to serfdom; and from serfdom to wage hire; and his ultimate position will be that of partner," and this is what it has to be if we are to have peace. (Hear, hear.)

THE "CO-PARTNERSHIP JOURNAL."

One thing more I wish to say. Our employees a year ago started a magazine called the "South Metropolitan Co-Partnership Journal." They have carried it on for twelve months; and I must say that it has been productive of great good in promoting unity between all ranks of the Company's servants, and has been conducted in a thoroughly creditable manner. If any shareholder would like to have a copy of it, he has only to write to the office; and if shareholders like to become subscribers, it is only 1s. a year—*plus* postage, I suppose. The publication has received commendation in many quarters. I move the adoption of the report.

THE RECENT ILLNESS OF THE CHAIRMAN.

Mr. SIMPSON ROSTRON: I rise to second the motion; but before I say a word about it, there is one little matter to which it is a duty as well as a pleasure to refer. Since the last meeting, our worthy Chairman has passed through a serious illness; and I am sure I am voicing the feelings of all present in this room when I say that you will join with his colleagues in welcoming him back in improved health.

THE INCREASE IN PREPAYMENT CONSUMERS AND GAS-FIRES.

I will only supplement the very ample remarks of the Chairman in one or two respects. Without wearying you with figures, I will put the abstract result; and then you will appreciate what this vast increase in automatic consumers and gas-fires really means. We have just taken out the figures for the last five years; and I find the result is this: In automatics, since 1899 to the end of last year, the increase in number is 81 per cent. Stoves and fires are increasing even faster. The increase of automatic consumers and stoves and fires is over 100 per cent. It may be said: "Yes; but what about ordinary consumers from the bigger houses?" Well, as regards the use of gas-fires, that is satisfactory too, because I find that in 1899, compared with 1904, the increase of stoves among ordinary consumers is close upon 50 per cent. I notice myself, I need not say, a very large increase in the use of gas. These figures show the large field there is for increase, because this goes on every year automatically and pretty constantly. I will give you the figures, if you like to hear them, for the last two years. In 1903, the increase of automatics was 16,700; last year it was 17,000. And the same with regard to stoves. In 1901, the number of automatic stoves was 12,600; in 1902, 12,900; in 1903, 18,600; and last year, 18,900. So there is an ample field, and we are perfectly ready to supply it. I think these general remarks will show you that, under the able superintendence and presidency of our Chairman, assisted by our able officers and workmen, you have no fear for the future. I have great pleasure in seconding the motion.

Mr. WHITTAKER asked if there were any restrictions on the increase in the price of gas consequent upon it having once been reduced.

Mr. QUAIL congratulated the Board and the shareholders on the improvement in the value of the shares since the last meeting. South Metropolitan stock was then quoted at 118, and to-day it was at 132, though there had been a slight sagging after the publication of the report, as an indication that the Company were not quite earning what it was proposed to pay in dividend. This showed that, in the appreciation of the public generally, the Company's securities were first-class. With regard to the reduction in revenue, he thought it would be well, for the purposes of comparison, to show the revenue of the previous half year. The actual reduction had been stated by the Chairman to be £53,000 odd compared with the corresponding half of 1903. But he (Mr. Quail) found that the revenue from the sale of gas in the December half of 1903 was £653,000, while in the past half year it had been £584,000—showing a decrease, in round figures, of £69,000. He would be glad if the Chairman would explain the discrepancy. The report also did not show that the consumption of gas was "growing in an increasing ratio," as the Chairman had said. Before the price was reduced to the present low figure, there was an increase of 4 per cent. in the consumption; but during the past half year, notwithstanding the reduction in price, the increase had been less than 3 per cent. This showed that there was a decreasing ratio; and that the elasticity of the revenue was rather falling off. He called attention to this fact with a view to urging, as he had done before, that considering the increasing competition on all hands, the Company might push their business a little more by letting the public have some demonstration of the superiority of incandescent lighting even over the electric light. He was certain that gas was holding its own; but, in face of competition, it was necessary that gas companies should be alive to their opportunities, and push their business.

Mr. HOGARTH called attention to the alarming increase year after year in rates and taxes. In the past half year nearly £40,000 had been taken from the Company's funds in this way; and putting the total at £80,000 a year, it represented an enormous figure when capitalized. Was there any possibility of the Gas Companies uniting with the great Railway Companies, who were also fully alive to the importance of this matter?

The CHAIRMAN: I will answer Mr. Hogarth first. The rates for the half year were £38,035 in 1903, and £38,142, or £107 increase, in December, 1904. Well, the figures are very heavy; but I can assure Mr. Hogarth that the Company do everything they possibly can. At every quinquennial valuation we have had a fight until last time, when we did not fight. The briefs were delivered, and our figures were practically accepted; and we are prepared on this occasion to do the same, if necessary. Last year the rating came to 1s. 3¾d. per ton of coal, or about 1½d. per 1000 cubic feet; and this year it came to 1s. 3¼d.

per ton, or about the same. Now as to the pushing business. I can assure Mr. Quail we are doing all we can to push the business, and are taking every means in our power to show the consumers the advantage of the incandescent burner by fitting up show-rooms and in various ways. We have recently fitted up a fine one at Clapham; and I think anyone who cares to go along the Clapham Road will be pleased with it. We have established a special body of canvassers in order to get new customers. We are offering a bonus to any of our employees who will secure additional customers; and there is one young fellow who adds largely to his income in this way. Last year I think he got 800 new customers; and he received about £80 or £90. The other matter that Mr. Quail referred to is the apparent discrepancy in the gas-rental; and I think I can give him an answer to his suggestion that we should print in the margin the corresponding figures of the previous year. I object to printing corresponding figures for this reason. To understand them all the facts must be known; to print the figures of the corresponding half year in the margin would often entail an explanation of why they are different. Mr. Quail's question is a case in point. In the December half of 1903, the item for public lighting, including labour and material for the public lamps, was £29,175. This was not for gas only; something like half of it was for labour, maintenance, mantles, painting, cleaning, and all the rest of it. In 1904, the entry for public lighting is £14,700, which is for gas only; and the charge for lighting and maintenance is dealt with on the other side. Now, if against the item of gas consumption, £584,000 in 1904, we had put the item of £653,000 for 1903, and said there was a difference of £53,000, people would have remarked: "Why, on your own figures there is a difference of nearly £70,000;" and it would have required explanation. These corresponding figures are likely to mislead; if anybody wants an explanation, he can have it. As to the ratio of increase, I do not think I used the words "ratio of increase." If I did, I am afraid I did not make myself very clear to Mr. Quail. What I was speaking of was the increase of business set forth in the report; but I distinctly said that this increase of business brought us an increased consumption of about 270 million cubic feet in the half year. But the actual increase of the half year was only 170 million feet; so that there was a loss of 100 million feet last year attributable to the substitution of incandescent mantles for the ordinary burners. I think that is the true explanation; and under these circumstances the increase of nearly 3 per cent., as against 4 per cent. in the June half, or as against 6 per cent. a few years ago, is a very satisfactory thing indeed. In fact, I am satisfied that if we had not had the incandescent mantle, and we had not lost business, our 3 per cent. would have been 6 per cent.—if it had depended on ordinary consumption, and if there had been no saving by the incandescent mantle. As to Mr. Whittaker's question whether there is any restriction on raising the price, the essence of the sliding-scale is that if you reduce the price you may pay an increased dividend; increase the price, and your dividend must be reduced. One of the great advantages of the sliding scale is that it identifies the interests of shareholders and consumers. We have gone further, and have identified all three interests—shareholders, consumers, and employees—and I think this is the soundest principle of business. If we can serve the consumers well, we may take a little extra dividend. If we serve them badly, we have to suffer in dividend. As to Dr. Drysdale's question about coal, we are carbonizing practically the same coal; perhaps, if anything, we are using rather better. I thank Mr. Rostron for his very kind remarks, and the meeting for their sympathetic reception of them.

The motion was then adopted.

The DEPUTY-CHAIRMAN (Mr. Robert Morton) moved the following resolution: "That a dividend at the rate of 5½ per cent. per annum be now declared, and that the warrants be transmitted to the registered addresses of the proprietors by post."

Mr. C. DRUMGOLD (an Employee Director), in seconding the motion, dwelt upon the advantages of the co-partnership system.

The CHAIRMAN, in putting the motion, remarked that the Company had never paid a higher dividend than 5½ per cent.

The motion having been carried,

Mr. Simpson Rostron and Mr. John Mews were re-elected Directors, and Mr. George Maughan Hooker, Auditor.

The business of the ordinary meeting then closed.

Wharncliffe Meeting.

The SECRETARY, having read the notice calling the meeting,

The SOLICITOR (Mr. Blyth) stated the effect of the Bill dealing with the testing of gas, the procedure for forfeiture, &c., promoted by the three Metropolitan Gas Companies.

The CHAIRMAN moved—"That the Bill now submitted to this meeting, intituled 'A Bill to amend the Acts relating to the Gaslight and Coke, South Metropolitan, and Commercial Gas Companies, with regard to the testing of gas, procedure for forfeitures, and otherwise,' be, and the same is, hereby approved, subject to any amendments which may be made therein by Parliament and approved by the Directors." He said: I do not think I need say anything about this Bill. You have had it explained to you by the Solicitor, and you have the essence of it set out in the fourth paragraph of the report. It is to carry out mainly the recommendations of the Departmental Committee, and it certainly goes for removing several of the restrictions on the supply of gas. The London County Council have also introduced a Bill, the main points of which are practically identical with this. Therefore we merely want the formal sanction of this meeting to promote the Bill.

The DEPUTY-CHAIRMAN seconded the motion.

Mr. QUAIL asked what was likely to be the cost of promoting the Bill, and whether the object could not be attained by coming to terms with the County Council on the subject of their Bill.

The CHAIRMAN: We are going to try to do that. The County Council have intimated that they are willing to meet the Gas Companies; and the Companies have responded, cordially agreeing to the proposal. I think there is to be a meeting before long. Whether we shall agree on all points, is a doubtful matter; but I hope that the main points will be agreed upon. As to the cost of the Bill, we cannot consider that. We have to pay it, whatever it comes to.

Dr. DRYSDALE said he understood the Chairman to say that the question of sulphuretted hydrogen and ammonia was to be left out.

The CHAIRMAN: As to sulphuretted hydrogen, the Departmental Committee recommended a less stringent test. The test of sulphuretted hydrogen as employed by the Referees was of the utmost severity. As you know, Dr. Drysdale, the acetate-of-lead paper is most extraordinarily sensitive. In the way the Referees prescribed it should be used, a jet of gas is caused to impinge on this acetate-of-lead paper for fifteen hours—a test which will discover one part in 10 million parts of gas; and the effect of the use of such a test has been to cause the gas companies to increase their purifying plant by 50 per cent. The Referees have taken too narrow a view of their duties. When Parliament said there was to be no sulphuretted hydrogen in gas, they took it to mean that there was to be absolutely none; but in the Gas-Works Clauses Amendment Act, Parliament has specified what they mean by "no sulphuretted hydrogen." They say the acetate-of-lead paper is to be exposed for three minutes to a stream of gas, whereas the Referees have been exposing it for 15 hours.

Mr. R. MOORE spoke of the inconvenience experienced at the time he lived at Bankside from the discharge from the gas-works, and asked if the Bill had for its object the better purification of gas.

The CHAIRMAN: The Bankside works make less gas than they did when you were there; but, unfortunately, we are still obliged to use lime for purification at Bankside, and this causes a nuisance to the inhabitants in the neighbourhood. It has been proved to the satisfaction of the Departmental Committee that this use of lime is most objectionable; and the advantages obtained from its use are practically no good to the public. The lime enables the companies to reduce the so-called sulphur compounds from 35 grains to something under 20 grains in 100 cubic feet—or, to put it another way, from about 1 in 650 to about 1 in 1000. Well, the Departmental Committee reported that this was no advantage to the public. I think some credit was due to this Company in respect of this matter. It was a singular thing that the scientific men who were testing for sulphur always tested the gas. It was Dr. Letheby who, in 1854 or 1855, found that the gas, after the sulphuretted hydrogen, which was the really objectionable impurity, had been removed, contained other sulphur compounds. He published the result, stating it at so many grains per 100 cubic feet. The statement created a strong prejudice; and then Parliament interfered in 1860, and said we must reduce this sulphur. We said: "We cannot do it, except by the use of lime, which is a great nuisance;" and though we were under the restriction, we did not take any notice of it. Between 1860 and 1870, oxide of iron was used; and the sulphur compounds were left at about 30 to 35 grains per 100 cubic feet. Then came the Referees, who were to prescribe to what degree of purity gas could be purified without causing a nuisance; and they prescribed a reduction to 17 grains in summer and 22 grains in winter. We have all along been testing for the sulphur in the gas. The real matter is what there is in the air of a gas-lighted room; and these clever people assume that if there is so much sulphur in the gas, and if you burn so much gas in a room, there will be so much sulphur in the products of combustion. Well, I believed it was a scientific fad all through, and have been struggling against it up to this day; and I think we have succeeded at last in pricking the bubble, and knocking this bugbear over. Last year it occurred to us that there could be no appreciable difference in the air of a gas-lighted room whether the gas contained 15 grains or 35 grains of sulphur. I did not think of testing it for other purposes, but only to see whether there was any difference. We employed two very able chemists—Mr. Hehner and Dr. Rideal—to make the experiments; and we gave them authority to conduct them in any way they pleased. We selected a workman's cottage, because Dr. Percy Frankland had said in the House of Commons that this sulphur was very detrimental to workmen burning gas in their small rooms; and we fitted up one room with gas with 35 grains of sulphur, and the other with gas purified by lime, containing only about 12 to 15 grains, and the chemists set to work. They first tested the amount of sulphur in the outside air, and then the sulphur in the two rooms; and generally they found less sulphur in the air of the rooms than they found in the outside air. They made the case as bad as they could for the gas. They stopped the chimneys, and pasted over the crevices of the doors and windows, so that there should be no ventilation; and yet they could not get one-tenth the quantity of sulphur which, according to theory, there ought to be in the air of a gas-lighted room. Where did it go? The conclusion that they were driven to was that the lime in the ceiling of the room and in the walls under the paper absorbed the sulphur products more quickly in some cases than they were formed; so that, whatever sulphurous products came into the air of the room produced by the burning of gas were absorbed by the lime. Well, this was mentioned to the Departmental Committee. They were men of eminence, and they said: "We should like to see what would be the effect in a glass room." We could not very well make a glass room, but we could varnish it. So the ceilings and walls were varnished; and then the Chemists could not find sulphur in the air. Where was it? If you varnish a room, the water from the combustion of the gas condenses on the walls and windows; and they found sulphurous acid in the water there, but they could not find it in the air. This evidence was given to the Departmental Committee; and I think it went a long way to convince them that the sulphur fad was utter nonsense. But here is a funny thing. For fifty years it never occurred to anybody to test the air of a gas-lighted room until it came about, we may say accidentally. They tested the gas but never the air. But only a few gas companies in England are subject to this vexatious thing. The foul lime is very objectionable; and the removal of it from the purifiers is very hard on the workmen. It affects their sight; and very often they have to go home partially blind for a day or two. It is not unhealthy. I may say our Solicitor, Mr. Blyth, examined all the Acts of Parliament since 1860—there are more than 700—dealing with gas. About 150 of them applied to corporations who supply their own gas, but only two of them have any sulphur restrictions at all, and these bodies take no notice of them; they do not attempt to purify their gas. In France no

notice whatever is taken of the sulphur, and only in one or two places on the Continent is there anything said about it. Of all the companies —about 480—having statutory powers, 48 only have sulphur restrictions. When the South Suburban Company (the Crystal Palace District Company as it then was) put this matter before the Committee of the House of Commons of which Sir John Brunner was Chairman, he said to the other side: "You have got to meet this. Only 48 of the companies and none of the corporations have these restrictions. If they are right, why are they not general? If they are wrong, let them be done away with altogether." Happily this Bill is to do away with these restrictions; and I am pleased to think that the County Council have recognized that it is useless to contend for the maintenance of lime purification. It will not hurt the consumer in any way whatever; in fact, the sulphur compounds do not exist in the air of the rooms. Therefore we can say you will be no worse off, and the inhabitants in the neighbourhood of gas-works will be saved a considerable amount of nuisance. The men will be relieved of the most disagreeable work they have to do in connection with gas making; and the companies will be free to do the best they can.

Mr. MOORE: My remark applied more to the manufacture of gas.

The CHAIRMAN: Very well then, it relieves the manufacture from a very objectionable process.

The motion was adopted.

The CHAIRMAN said the next resolution he had to move had reference to the Company's Bill: "That the Bill now submitted to this meeting, intituled 'A Bill to provide for the retirement of the Gas Referees appointed in relation to the testing of gas supplied in the Metropolis, to empower the South Metropolitan Gas Company to purchase lands, and for other purposes' be, and the same is hereby, approved, subject to any amendments which may be made therein by Parliament and approved by the Directors."

The SOLICITOR explained the provisions of the Bill.

The CHAIRMAN: This matter is set out in the fifth paragraph of the report. All I have to say about the Referees is that their work is done. In all other cases the requirements that Parliament may make of a gas company are set forth in the General Acts or in the Special Act. Those requirements can be fully set forth in that way; and then they are fixed. When the Referees were appointed in 1868, there were certain doubtful points. One was whether the gas could be purified from these sulphur compounds, and whether the purification created a nuisance or not. They also had to prescribe the burner. The burner which was then prescribed was one invented by our friend Mr. Sugg, and was a very good burner. The best at the time was prescribed; and this stopped improvement of the argand burner. The Referees also prescribed how sulphuretted hydrogen was to be tested; and I have explained, in answer to Dr. Drysdale, that it entailed a great deal of trouble on the companies, with no benefit to the public. It was now found that the sulphur restrictions were a mistake, and the Referees might have done what the Departmental Committee have done, and said: "There is no advantage to the public in this restriction." On the whole, we contend that the gas industry ought to be free from all needless restrictions, and from the interference of people who really do not understand the business. The Act of Parliament appointing the Referees provided that there should be three competent and impartial persons, one of them always to be a man having had practical knowledge and experience in the manufacture and distribution of gas. This was carried out at first. The Government in 1869 appointed three Referees, one of whom was a civil engineer, one an eminent gas engineer, and one a writer, but a very clever man. After a few years, these three men resigned, and others were appointed. It is true one civil engineer was selected who knew a little about gas distribution, and the gas companies weakly acquiesced without raising any question as to whether he had practical knowledge and experience in the manufacture and distribution of gas. So it went on; but at last we got to these three University Professors. I say nothing against them as men of science; but I do say that they are not the men to have control of a great industry. I knew the late Thomas Ismay, the founder and head of the White Star line. I should like to know what he would have said if an Act had provided that there should be three Referees appointed to control the working of that great line—or we will say the Cunard line, as the White Star has gone over—one of whom should have practical knowledge of the building and working of steamships, and University Professors had been appointed who knew nothing of a steamship except from just going over her. I can tell what he would have said—"We will pay no heed whatever." We have done that now; and at least one-third of the gas for about four years has not been tested at all. The public have been just as well off (laughter); and the London County Council, when I said that the gas had not been tested, answered that it had been tested privately, and they found it right. All I can say is that, if we were rogues, our consumers would soon find us out. Seeing that we are confined to the same body of customers from year to year, and have been for three-quarters of a century, they would soon discover it if we were dishonest. We say that the time has gone by now for a great industry to be hampered and restricted by gentlemen who have had no experience of commercial life—whose appointment is not in accordance with the Act of Parliament. Therefore we ask for their abolition. It is said: "The other Companies do not join you." Well, there always has to be a pioneer. The other Companies dislike the Referees, I think, as much as we do; but they leave us to fight the battle. We are bound to do it; and I hope we shall succeed. At any rate, we will try.

The DEPUTY-CHAIRMAN seconded the motion, which was carried.

Mr. HOGARTH, in proposing a vote of thanks to the Chairman and Directors, welcomed Sir George Livesey's return to the chair after his recovery from illness.

The motion having been carried,

The CHAIRMAN said: It is a great satisfaction to all my colleagues, as it is to myself, to meet shareholders as we do here. It is a great pleasure to find so large a meeting, and that we require the Great Hall of the Cannon Street Hotel; and especially I would say we regard the meetings with our shareholders as among the most pleasant gatherings we have throughout the year. I am quite sure I am expressing the feelings of my colleagues as much as of myself, when I return our hearty thanks for your kindly reception of us at all times. The Chairman concluded by proposing a vote of thanks to the officers and staff, with special reference to Mr. Carpenter, the Chief Engineer, and Mr. Frank Bush, the Secretary.

Mr. CHARLES CARPENTER, in acknowledging the vote, remarked that he could honestly say, speaking for the staff as a whole, that the compliment was well deserved. The branch of the staff concerned with pushing the use of gas had done a great deal the last twelve months. A great many manufacturers were taking warehouses in South London for the purpose of more economically carrying on their business. One of the simplest methods of applying power was by means of electric motors; and the most economical way of supplying the current necessary to drive these motors was by the employment of gas-engines. In South London the Company's canvassing staff had done a great deal to bring to the notice of manufacturers the advantages offered by gas-engines in various industries. Of the gas-engines sold for the purpose, the smallest was of about 1¼-horse power and the largest 60-horse power. A great deal had also been done in the direction of gas appliances; consumers in South London having been persuaded in the last twelve months to spend £21,688 in this direction. As to the extent to which the incandescent mantle was responsible for the slow increase of consumption, it had been ascertained that 75 per cent. of the 100,000 ordinary customers were now using incandescent burners. He thought it fair to assume that these burners were employed in places where most light was required, and where they would be most economical; and taking this fact into consideration with the increase of 2·9 per cent., it proved that there had been a satisfactory and real increase in consumption.

Mr. BUSH referred to the Bills before Parliament and the approaching quinquennial valuation as showing that the Chairman was likely to have a very busy year. With regard to rating, they had had to take out figures to give to their advisers; and it was found that five years ago the amount paid in rates was £58,000, while for the year 1904 the amount had jumped up to £74,000—an increase of £16,000 or about 27 per cent. This was nearly entirely due to increased rating in the pound. In many parishes five years ago the rates were from 6s. 8d. to 7s. in the pound, and most of them would think if they were paying 6s. 8d. they were doing pretty well; but in many of the parishes the rates had gone up to 9s. 2d., 9s. 4d., and in one case to 9s. 7½d. He thought, therefore, they should do the best they could to check municipal extravagance.

The proceedings then terminated.

End of the German Coal Strike.—The great strike of German miners, to which reference was made in the "JOURNAL" for the 24th ult., and in which 200,000 men were involved, came to a sudden end last Thursday. By an almost unanimous vote of the miners' delegates, the most serious labour war ever fought in Germany has resulted in a victory for the colliery-owners. The funds of the miners were exhausted, and at a meeting attended by 200 men's representatives, 195 voted for a resumption of work on Friday morning on the old terms. The decision was communicated to the miners at hundreds of mass meetings held in the evening, and was received with indignation.

Sheffield Water Supply.—Last Friday week there was a largely-attended meeting of the Sheffield Society of Engineers and Metallurgists in the Technical Department of the University College, when a highly interesting lecture was delivered by Mr. William Terrey, the General Manager of the Corporation Water Department, on "The History and Description of the Sheffield Water-Works." It was illustrated by a large number of lantern slides. The President of the Society (Mr. W. H. Ellis) was in the chair, and, in addition to members of the Society, there were numerous visitors present. Mr. Terrey, who was accorded a hearty reception, traced the history of the water undertaking from the early times first down to the days of the Company, and then to its acquisition by the Corporation in 1888 for £2,092,014. Speaking of present-day conditions, Mr. Terrey said the total daily quantity of water distributed varies from 10 million to a maximum of 14 million gallons per day during the summer months. The least draught upon the reservoirs is between three and four o'clock in the morning; and the maximum draught between eleven and twelve at noon. The average volume of water required varies from 10 to 40 gallons per head per day, of which a large proportion is waste. This, said Mr. Terrey, no regulations or supervision can wholly suppress.

Wrexham Town Council and the Gas Company's Bill.—At a meeting of the General Purposes Committee of the Wrexham Town Council last Tuesday, Mr. Taylor stated that a letter had been received from the Secretary of the Gas Company (Mr. W. Heyward), acknowledging the receipt of the Town Clerk's letter as to the decision of the Town Council not to oppose their Bill, on the understanding that a proviso to clause 53, the terms of which were explained in the letter, were inserted. Mr. Heyward, however, said that his Directors were advised by their Parliamentary Agents that the proviso should be accompanied by the insertion of a stipulation for the protection of the Company in case of strikes, &c.; and he enclosed the draft proviso, showing the suggested addition, to which the Directors trusted the Council would agree. The proviso was as follows: "Provided that, notwithstanding anything in this section contained, the price to be charged by the Company for gas supplied to the public lamps shall not at any time exceed 2s. 3d. per 1000 cubic feet, unless, in the opinion of an arbitrator to be agreed on by the Company and the Mayor, Aldermen, and Burgesses of the Borough of Wrexham, or, failing agreement, to be appointed by the Board of Trade, it is reasonable that such price shall be increased in consequence of accidents, strikes, large increase in the cost of coal, or other exceptional circumstances; and such arbitrator shall in his award fix the increased price and the period during which it is to be charged." In this proviso, Mr. Taylor added, the words "cost of coal" were substituted for "cost of production" in the original proviso, and the word "exceptional" was added immediately before the word "circumstances." He considered the proviso as now drawn was a very fair one. The Committee approved the proviso, and the Town Clerk was instructed to inform the Company of their decision.

SOUTH SUBURBAN GAS COMPANY.

Persecution or Prosecution ?—The Fresh Application to Parliament.

The Half-Yearly Meeting of this Company was held last Friday at the Albion Tavern, Aldersgate Street, E.C.—Sir GEORGE LIVESEY in the chair.

The SECRETARY (Mr. Charles M. Ohren) having read the notice convening the meeting, it was agreed to take as read the Directors' report and the accounts, from which some extracts were published last week.

The CHAIRMAN, in moving the adoption of the report and accounts, said, as a rule, the accounts dealt so fully with the position of the Company that it rendered a great deal of explanation from the chair unnecessary. In reference to the first paragraph of the report, he might say that the Company, true to the tradition of always reducing the price of gas whenever they were able, did so by a penny last June. These penny reductions were introduced, he believed, by this Company. The late Mr. Henry Palfrey Stephenson, at one time Deputy-Chairman of the Company, and afterwards the Chairman, many years ago said, "instead of waiting until the price can be reduced 2d. or 3d., reduce it by a penny when you can." A penny did not seem much; but the policy had been followed ever since with, he (Sir George) was certain, advantage to the consumers. It had enabled the Company to give these small reductions from time to time without causing great fluctuations in the revenue. When, however, it was considered that a penny per 1000 cubic feet meant £2740 in a half year, or about £5500 in a year, it was seen what a considerable boon it was to the consumers. The price of gas was now 2s. 5d. per 1000 cubic feet. There was only one Suburban Company supplying at a lower price; all the others were higher. Therefore he thought the Company might take some credit for doing their best, at any rate, in this direction to serve the consumers. On the half-year's working, they only had a surplus of £1300, which was equivalent to about, or rather not quite, ¼d. per 1000 cubic feet, and showed that the reduction left only a small margin. The proposal of the Directors was that a dividend should be paid at the same rate as last half year—viz., 5½ per cent. This was, under their bargain, the utmost dividend they could pay for the moment. At 2s. 5d. per 1000 cubic feet, they could pay 2s. 6d. per cent. more. But there was a special reason for making the last penny reduction (to which reference was made in the second paragraph of the report); and the Directors gave their word that they would give the consumers the full benefit of the saving that might be effected by the alterations referred to in that paragraph without taking, for a year at any rate, the increased dividend to which the proprietors were entitled. He thought he might leave the accounts with the simple statement that they had taken £2200 from the net revenue account to add to the insurance fund, which now amounted to over £12,000. This fund was to meet any unavoidable or extraordinary accidents which might come upon them very unexpectedly. The Board were of opinion that the insurance fund should be increased to the full limit. The full amount to which they were entitled to increase it was £22,000, or 5 per cent. on the cash received on the ordinary stock. With regard to the next paragraph in the report, he had no doubt that some of the proprietors had noticed in the public papers that the Company had been prosecuted for not supplying gas of the standard purity. The Company, by their Act of 1893, were not to be subject to a penalty unless the sulphur compounds in the gas amounted to 30 grains per 100 cubic feet on any one day, or a lower average for six days. But as the average for the six days did not come into the question on this occasion, he would only deal with the 30 grains for one day. The Company had been under considerable difficulty in regard to the removal of this sulphur. It could only be done by the use of lime; and wherever lime was used for this purpose, it created a nuisance. It was, in fact, the use of lime for purification that had given gas-works the evil name they had for causing an objectionable nuisance in their neighbourhood. Many years ago, lime was found to be unnecessary, and oxide of iron was introduced for purification, and then the nuisance was prevented. Then somebody found out there was a small quantity of sulphur in the gas which was previously unsuspected. The chemists stated this quantity in most misleading terms. They stated it in grains of sulphur per 100 cubic feet of gas. Now, grains and cubic feet were not comparable—one representing weight, and the other measurement. But the effect was this, when 30 grains in 100 cubic feet were spoken of, people who looked at the figures superficially supposed that it was 30 per cent. (not grains), or 30 in 100. The fact was this 30 grains in 100 cubic feet, instead of being 30 per cent., was only $\frac{3}{7}$ part of 1 per cent. One hundred cubic feet of gas weighed 22,000 grains about; so that it was 30 or 35 in 22,000. However, this mistaken notion had tended largely to create popular prejudice about this sulphur-in-gas question. All sorts of methods had been tried; but nothing had succeeded, excepting the use of lime, which caused a nuisance to the inhabitants in the neighbourhood of the gas-works. The Company had had complaints about it; and had been prosecuted. Therefore, in 1903 and 1904, they introduced Bills to get relief from the requirement to reduce these sulphur compounds from about 30 or 35 grains to something under 20 grains on the average, and failed. They were put off, because it was said the Board of Trade were going to appoint a Committee to consider these matters. The Board of Trade did appoint a Committee; and the Committee sat last year, and came to the conclusion that it was a mistake to deal with this sulphur at all. Witness after witness was asked whether 35 grains of sulphur in 100 cubic feet of gas, in cases where the gas was purified by oxide only, was detrimental to the health of the consumers. Every one of those in favour of the removal of the sulphur were obliged to say it had never been proved that it had the slightest injurious effect on health. On the other hand, the process of removal was proved to be a great nuisance in the neighbourhood of gas-works; and it was proved that the labour connected with it was very trying to the workmen. In the result, the Departmental Committee reported that, in their opinion, the restriction should be removed. This being so, the Board felt the time had come when they might take action. The complaints of nuisance were continuous; and, in order to relieve their neighbours of this great inconvenience, it was resolved last summer, in accordance with the circulars sent out to every proprietor as well as to every consumer, to make the experiment of abolishing the use of lime, and see whether it made any difference. The Directors were satisfied it would not make any difference to the consumers. Everyone of the Local Authorities to whom they had sent this circular, except one, had met it in the right spirit. The Directors asked them to deal with the matter reasonably, in order to fairly test the experiment. "This," as stated in the report, "five out of the six Councils have done; and the Directors take this opportunity of thanking them for their consideration." One of the Councils had not dealt with the matter in the same spirit. The "Progressive" Board of Lewisham had taken action against the Company on two occasions. On the first occasion, a nominal penalty was imposed: and, on the second, the Magistrate at first practically gave a decision in the Company's favour. They showed they could not reduce the sulphur compounds without creating a nuisance; and he (the Chairman) believed they convinced the Magistrate that this was an "unavoidable cause," which, under their Act, exempted them from penalty. He said: "I will adjourn this case *sine die*, and I do not think it will be necessary for it to come forward again." Then the other side asked to be allowed to present rebutting evidence. They had stated their case, and produced their evidence. It was true they only called one witness. But they had stated their case, and had had full liberty in the matter. The Company replied, and produced their one witness. And what he (the Chairman) had already stated was the expression of the Magistrate's opinion. However, the Council asked for permission to present rebutting evidence; and they were allowed to do this. This was another hearing. The Magistrate listened to the rebutting evidence, and then seemed to be convinced that the Company had not adopted all the means they might have done for reducing the sulphur, even when they had abandoned the use of lime, or, if they used lime, they could have done it in such a manner as not to create any nuisance. The gentleman who gave evidence on this second occasion for the Council was a chemist. He (Sir George) was not going to criticize the evidence. He merely stated the fact that it was given. But this witness mentioned a number of different schemes—some four or five—which the witness had heard had been tried to obviate the nuisance. One was to select the coal, another was to mix lime with the coal before carbonization, a third was the ammonia process, and there were one or two others. Mr. Hunt—their very able Director—who had been engaged in gas manufacture nearly all his life, was allowed to give evidence, but only partially, in opposition to this. The evidence given by himself (the Chairman) on the previous occasion dealt with some of these points; but he did not deal with them all, because he was not asked, and did not know they would later come up. The Magistrate believed this chemist's evidence in preference to Mr. Hunt's or his own. He (the Chairman) thought he could say this, that so far as Mr. Hunt and himself were concerned, altogether they could muster not far short of a hundred years' actual gas experience; and the other gentleman whose evidence was accepted had never had actual practical experience in the manufacture of gas. The Company were going to appeal; and he thought they had very good reason for hoping they would prove their case. This, however, was merely an episode; all they cared to do, and were endeavouring to do, was the best for their consumers. They were endeavouring to do what was best for the gas industry; and they claimed to know what was best for the industry. They claimed to be reformers and pioneers; and it was the fate of reformers and pioneers to be met by ignorance and prejudice always, and all the world over. This was simply an incident in the struggle in which the Company were engaged; and they believed they would eventually succeed in getting freedom from the obligation to remove these sulphur compounds, especially after the report of the Board of Trade Committee. The Committee had been convinced it was a mistake; and the London County Council had accepted their decision. The three London Gas Companies would get freedom from this obligation; and it would be very strange if the same Committees of Parliament—as probably they would be—who granted the relief to the Metropolitan Companies would not grant it to the South Suburban Company. What they had to do was to satisfy the consumers that they were doing the best they could for them. Some of his remarks would in all probability get into the papers; and he wished to say to their consumers that it would be the greatest satisfaction to the Company if there was anything the matter with their gas if they would communicate direct with them. He had heard only indirectly that day of one consumer (who was a man much respected, and a man who did not exaggerate complaints) that his supply of gas was very bad, that it blackened his mantles, and that he could not get a proper light. If he would write direct to Mr. Shoubridge, it would be found that there was some cause—some local cause—for this blackening of the mantles. It was impossible that this could be caused in one case and not in others by the gas. It must be something connected with the burner—perhaps this not getting a proper mixture of the gas and air. He (the Chairman) was convinced that, if consumers troubled in this or any other way would apply to the Company, the difficulties would be removed. There were only two bodies of people the Company were anxious to stand well with—the proprietors and the consumers. The Directors knew they stood well with the first named. They felt they had the confidence of the proprietors, who had always shown the Board that they trusted them. Then the larger body of the consumers, they wanted to stand well with them also—even in one sense more so than the proprietors. If they did not stand well with them, they would lose their business. The times were very much changed from the old days when the consumer had to have gas or nothing. He (the Chairman) met a customer in the City the day before; and he said: "I object to the reduction of the illuminating power of the gas, because I don't like the incandescent mantle; and if you get authority from Parliament to reduce the illuminating power of my gas, I shall have it cut off." This showed his independence of gas. If the Company did not supply gas that suited the consumer, he would leave them;

and therefore it was to the Company's interest to—in fact, it would be suicidal if they did not—do everything in their power to satisfy them. Therefore, the Company asked that all reasonable freedom should be given to them, in order to do their best in that direction. In regard to the fifth paragraph of the report, at the last half-yearly meeting the proprietors passed the scheme for the election of employee Directors, subject to approval by the Board of Trade. The Board of Trade had approved the scheme; and now it was in force in this sense, that they had authority to proceed to the election of employee Directors whenever might be thought desirable. They did not do it at once, because they considered it would be better to wait a year. Probably by the time they met at the next half-yearly meeting, something would be done. They had very little fear that the men would appoint, as their representatives on the Board, the best men among their body they could find for the work. At any rate, it was an experiment; and the scheme was not a permanent fixture. It was for three years only. At the end of the three years, it would expire, and could only be renewed by the introduction of a new scheme. This would give the proprietors an opportunity of testing whether or not it was a satisfactory movement. If it was not satisfactory, it would drop; if it was satisfactory, it would be renewed for another term. But he thought the latter part of the fifth paragraph of the report would reassure any who might be in doubt on the point. "The employees as stockholders share in profits and losses." This goes farther than profit-sharing; for it was only right that those who shared in profits should also share in losses. The employees were all stockholders; and combined they held a considerable amount of stock. If the business was prosperous, their dividends were secure; and they had the probability of getting increased dividends the same as the other stockholders. If the business was not prosperous, their dividends would go down the same as those of the other stockholders. "The employees, as stockholders, share in profits and losses; and by the election of Directors they will share in management and responsibility." This, the Directors believed, was necessary, in order to make their partnership complete. The Directors wanted the men to feel that they had upon them part of the responsibility of conducting the business properly, and to assist, in their way, in cheapening the gas as far as they were able. Then the Directors said in their report: "Partnership appears to be the true and ultimate solution of the differences between Capital and Labour." Certainly in the case of this Company, so far as their experience had gone, it was the absolute solution. Whatever their troubles might be, whatever the difficulties, there was one difficulty from which they were entirely free. There was never the slightest anxiety or trouble in regard to their workmen. Workmen and officers alike worked loyally together. As to a strike or anything like that, it was simply unthinkable. A man could not strike very well against himself. "The Company has travelled far on this road; for practically all the officers and workmen, to the number of about 530, are shareholders, holding stock of the value of £16,000, and with £6000 on deposit at interest, have a total holding in the Company of £22,000." Taking the average, this amounted to about £40 apiece. As most of those present knew, the position of the working man generally in this country was that he held no property; but in the case of their men they held an average of £40 of stock apiece. The great bulk of this stock was held by the workmen; the officers had their share. But the latter were comparatively few in number. But this average possession of £40 was an almost unique position for workmen to be in. Quite certain was he that it tended to elevate them in every way. He thanked most sincerely the proprietors, who had had their part in this matter, because nothing could have been done without their consent. Therefore, a certain, and not a small, share of the credit of this success of the scheme was due to the proprietors in supporting it, as they had done, so heartily and liberally.

The DEPUTY-CHAIRMAN (Mr. Robert Morton) seconded the motion, which was unanimously carried.

The DEPUTY-CHAIRMAN then moved the declaration of dividends at the rates per annum of 5 per cent. on the preference stock and 5½ per cent. on the ordinary stock, less income-tax.

Sir FORTESCUE FLANNERY, Bart., M.P., in seconding, said the whole of the Directors were entirely, and even enthusiastically, in accord with the policy which had been so clearly described by the Chairman. The views which he held were held as strongly by every member of the Board. They had been very much in the nature of passive resisters during the past half year, having been dragged into the Police Court against their will. But the position was quite clear, and would, he hoped, be early set right by Parliament. It seemed to him to be quite ridiculous that one gas company should have the law against it, because of a special law affecting it in regard to purification, and be liable to be hauled up for a nuisance, while to that one—and for every one in similar position—there were quite ten who had exemption from the law. If any of the proprietors happened to live in the neighbourhood of Thornton Heath, they would find this extraordinary position: In the one street, they had the mains of the South Suburban Gas Company, carrying the gas of the Company, who, if they purified the gas from sulphur compounds before it left their works, were liable to be brought to the Police Court for creating a nuisance; while if they did not purify the gas by lime, they were also liable to be summoned. In the very next street were the mains of the Croydon Gas Company who might do the same thing—purify the gas, or not purify the gas, just as they liked—without anything being done to them, simply because the law differed in their case. It was said that there was one law for the rich and another for the poor. Whether this was true or not, certainly it applied to gas companies; but which of the two he had named was the rich and which was the poor, he left the proprietors to choose. The South Suburban Company, as a Gas Company, were in the position of being persecuted—he used that word advisedly, as compared with prosecuted—simply because an accidental difference of a small character entered into one of the clauses of their Act of Parliament as compared with the other Company; and they were going to set this right in their next Act. The Directors intended to support the Chairman to the fullest possible extent, and diligently watch over the interests of the proprietors.

Proposed by the CHAIRMAN, and seconded by Mr. T. GUYATT, Mr. C. Lea Wilson was re-elected to the Board, as was Sir Fortescue Flannery, on the motion of the CHAIRMAN, seconded by Mr. SAMUEL WOOD.

Moved by Mr. WOOD, and seconded by Mr. H. D. ELLIS, the retiring Auditor (Mr. Guyatt) was also re-appointed.

The Wharncliffe Meeting.

An Extraordinary Meeting was then held, to consider the provisions of the Bill before Parliament, which has for its purpose the altering of the provisions of the Company's Acts "with respect to the illuminating power of gas supplied by them and the testing of gas, and for other purposes."

The SECRETARY having read the notice convening the meeting,

The SOLICITOR (Mr. C. F. T. Blyth), at the request of the Chairman, read the heads of the Bill.

The CHAIRMAN moved—"That the Bill now submitted to the meeting, intituled—'A Bill to alter the Provisions of the Acts relating to the South Suburban Gas Company with respect to the Illuminating Power of Gas supplied by them and the Testing of Gas, and for other Purposes,' be approved, and that the Directors be authorized to proceed with the same, subject to such additions, alterations, and variations as Parliament may think fit to make therein and the Directors approve." He said that the explanation he had to give about the Bill was shortly this. They could not supply the quality of gas—15 candles—required by their Act of Parliament from the available supply of coal. Newcastle coal such as they were bound to use would not produce this quality of gas; and, in order to get the higher quality of gas, they were obliged to enrich, or rather they had to up to last June, when they gave up enrichment, and took the risk of any proceedings that might be taken. The Directors were satisfied that unmixed coal gas was better for the consumers than a mixture of carburetted water gas and coal gas. Therefore the abolition of enrichment, instead of being a detriment to the consumers, would be an advantage. He thought he might say that at least 73 per cent. of their gas (he was of opinion it was more) was used for its heat-giving properties, either in gas-stoves, gas-engines, or incandescent burners. When the gas had to be used in the bunsen burner, the lighting power of the gas was destroyed before it was burned—the mixture of air with the gas rendering the flame non-luminous. The remainder of the gas consumed might be used in flat-flame burners, or part of it. But he did not think anything like 27 per cent. was now so employed. The reduction from (nominally) 15 candles to 13 candles would have no detrimental effect on the flat-flame users, because the Company were prepared to give them—they proposed in the Bill to give them—the best possible burner for burning 13-candle gas. The effect would be that the flat-flame users would get more light with 13-candle gas—considerably more—than with the burners now in use and 15-candle gas. The average quantity of light given by the indiscriminately chosen flat-flame burners in use worked out to something less than 10 candles; while, with the new burner, the Company would be giving them, he believed, practically 13 candles. Therefore the consumers would really be better off with the new burner and the lower quality of gas. A good many people did not believe that a man like himself (Sir George), standing in the position in which he was placed that day, was speaking the truth. He might say with reference to himself and Mr. Hunt (who gave evidence in the Police Court case) that they had something more to live for than to just bolster up a gas case. They had characters and reputations to lose. All the gas managers in the kingdom knew them; and if Mr. Hunt or himself was to make statements in the position he was then in, or in giving evidence, that were not true or that were overdrawn, they would lose the respect of the men whose respect they greatly valued. He could say for Mr. Hunt, for Mr. Morton, and for himself, that the respect so highly valued was of those with whom they had been associated all their lives in the supply of gas. If they were to turn round and say: "Hunt or Livesey made such-and-such a statement; we know, and they knew, what they were talking about, and they knew it was untrue," we should not like to face them again. The statement he had made there that day he believed to be true, and absolutely true. He felt sure that the lower quality of gas would be better for the consumers; and the Company would help them to burn it to the best advantage. In regard to sulphur restriction, Sir Fortescue Flannery had put the position very forcibly. There were 150 corporations in this country supplying gas, and only two who had sulphur restrictions imposed, and they ignored them. Out of nearly 500 companies, there were only 48 who were subject to sulphur restrictions; and in the case of 20 of the latter, no tests were made for sulphur. In the case of the others, tests were made in some four cases daily, and in others only occasionally. All the Company were asking for was the same freedom as was given to all the gas companies—save the 48—in this country. The electric light people were not under restrictions as to their current, or anything else. Why should gas companies be? He thought the justice of the case was clear. Of this he trusted they would be able to convince Parliament; and they certainly had good hopes of succeeding this year.

Mr. CHARLES HUNT, in seconding the motion, said he did so in the firm conviction that these provisions were framed in the best interests of the consumer, no less than in the interests of the Company.

The motion was unanimously carried.

Mr. H. D. ELLIS moved, and Mr. GUYATT seconded, a hearty vote of thanks to the Chairman and Directors.

The motion having been carried,

The CHAIRMAN expressed the gratitude of himself and his colleagues. Proceeding, he spoke, in the kindest terms, of the work of Mr. Shoubridge, Mr. Ohren, their respective staffs, and the whole of the workmen, and moved that they be cordially thanked.

Mr. ROBERT MORTON seconded the proposal; and it was unanimously carried.

Reply was made by Mr. SHOUBRIDGE and Mr. OHREN; and the proceedings terminated.

BRISTOL GAS COMPANY.

The Half-Yearly General Meeting of this Company was held last Thursday, at the Offices, Canons' Marsh, Bristol—Alderman J. W. S. Dix in the chair.

The Secretary (Mr. John Phillips) read the notice convening the meeting, and the report of the Directors, with the accounts for the six months ending Dec. 31, some particulars from which were given in the "Journal" last week (p. 368), was taken as read.

The Chairman, in moving the adoption of the report, said that the figures in the accounts were very plain and clear, and he did not think any remarks thereon were needed. One thing, however, he should like to put before the meeting, and that was the position of the Company at the present day, and compare it with what it was a few years ago. It was said not very long since that the concern was going to be wiped out by electricity. Some gentlemen were kind enough to remark that they would take care that the process was brought about calmly, quietly, and gradually, and not abruptly. Well, time had gone on and the extinction had not taken place, and he did not think it would. On this subject and the increase of the Company's business, he had some figures to lay before the proprietors. The electric light was installed in 1893. For the twelve preceding years the profits of the Company were insufficient to pay the interest and dividend by £23,000; showing an average annual deficit of £1900. The loss was made up by drawing from the balance of undivided profits and from the reserve fund. From 1893 to 1904 inclusive (but omitting the years 1901 and 1902, when the price of coal was abnormally high, though the price of gas was not raised), the profits exceeded the interest and dividend by £10,500, or an annual average surplus of £10,950. From 1881 to 1892 the average price of gas was 2s. 6d. per 1000 cubic feet. From 1892 to 1904 it had been 2s. 5d. Had the average for the latter period been kept at 2s. 6d., the extra profit would have been £96,000, or an additional average annual profit of £9600. The average price of coal from 1881 to 1892 was 1s. per ton less than from 1893 to 1904. The average price of residuals was 1s. per ton of coal used higher during the latter period; so that the one account would about balance the other, and the cost of coal was practically the same. The quantity of gas made was 1,658,101,000 cubic feet in 1892, and 2,455,391,000 cubic feet in 1904, being an increase of 797,290,000 cubic feet, or 48 per cent. The number of meters in use was 22,384 in 1892, and 41,402 in 1904—being an increase of 19,018, or 85 per cent. The stoves numbered 2196 in 1892, and 26,889 in 1904; being an increase of 24,693, or 1124 per cent. The total number of meters, &c., in use in December, 1903 and 1904 respectively, was: Meters, 38,384 and 41,402, increase 3018; prepayment meters, 8890 and 10,914, increase 2024; cookers, 23,084 and 26,889, increase 3805; miles of mains laid 343¾ and 347¼, increase 3½; gas made, in million cublic feet, 2345 and 2455, increase 110; and public lamps, 8796 and 9023, increase 227. Speaking of the relations between the Company and the Corporation, the Chairman quoted figures to show that if the city authorities had accepted in 1901 the offer of the Company to light the city by incandescent burners, a saving of many thousands of pounds would have resulted to the ratepayers. He had to announce that the Directors intended to reduce the price of gas to consumers by 2d. per 1000 cubic feet from the 31st of December. This meant a large sum—£20,000 a year; but the Directors saw their way to do it. He did not mean to say that next half year they would be able to carry forward a balance of £7000 or £8000, as they had hitherto done. They had, however, already built up a substantial balance from which they could draw. He thought that in good time they would be able to pay their dividends and interest, and carry forward a balance out of the revenue; but the shareholders must not expect this to be accomplished all at once. The Directors, nevertheless, believed that the reduction in the price of gas would lead to an increase in consumption.

Mr. G. K. Stothert seconded the motion, and it was carried.

The Chairman, in reply to a question, said that in some cities the electric lighting of streets was being given up or reduced, and the incandescent gas system resorted to. He did not think this method could be improved upon.

A motion was then carried unanimously increasing the salary of the Secretary by £100 per annum.

The Secretary having expressed his thanks for the addition, and the complimentary remarks by which it had been accompanied,

A dividend at the rate of 5 per cent. per annum on the nominal capital of the Company was declared, and the proceedings closed.

London Borough Councils and the Gas Bills.—The Bermondsey and Battersea Borough Councils have resolved to present petitions against the Bill of the South Metropolition Gas Company, as well as that of the Joint Companies.

Serious Gas Explosions at Railway Stations.—On Monday morning of last week, one of the waiting-rooms of the London and North-Western Railway Station at Wolverhampton was wrecked by a gas explosion, and unfortunately three of the Company's employees, who were in it awaiting the arrival of a train to take them to work, were injured. About an hour before the occurrence, the gas (which had as usual been alight all night) was turned out; and at that time there was no indication of an escape, while during the interval many people entered the room but made no complaint. The injured men were removed to the hospital, where it was found that one had sustained a fractured ankle, another had both legs broken, and the third was suffering severely from shock. On Thursday afternoon, an explosion occurred at the southern end of the Central Station of the Caledonian Railway in Glasgow, by which about 100 feet of a platform were blown up. It appears that during the process of making a connection with a main conveying gas for lighting the carriages, an accumulation of gas under the platform was ignited, doing considerable damage, and injuring four men, who had to be removed to the Infirmary. Fortunately, the platform in question stands well out of the station.

PROVINCIAL GAS COMPANIES.

As usual about this time of the year, reports are reaching us in connection with the working of the undertakings of gas and water companies in various parts of the country; and we take from them the particulars which are of most general interest.

Modernizing Plant and Better Working at Cambridge.

The advantages accruing from the introduction of modern carbonizing plant were made evident at the recent meeting of the Cambridge Gas Company. The Chairman (Mr. E. H. Parker), in moving the adoption of the report, said the satisfactory results which had been obtained in the past half year were mainly due to the manner in which the coal carbonizer had operated; and the Directors felt there was great credit due to the Engineer and Manager (Mr. J. W. Auchterlonie) and the carbonizing foreman. The quantity of gas made had increased by 7,579,000 cubic feet, and yet only slightly over 13 tons more coal had been used. The make of gas per ton was 10,979 cubic feet, against 10,475 cubic feet—an increase of 504 cubic feet per ton carbonized. This was due both to careful carbonizing and to the good quality of the coal which the Manager had obtained. The work of renewing the plant had been continued at a cost of £2688, which was a large sum, and he was afraid they had further heavy expense before them; for, among other things, they would soon have to face the question of putting up a new gasholder. Their trade in the half year had increased to the following extent: Ordinary consumers, 120; cookers, 35; heating-stoves, 49; slot meters, 219; and slot cookers, 199. This satisfactory condition corresponded with the general improvement of the gas industry throughout the country. The amount available for distribution allowed of the payment of the usual dividend with a surplus of £931.

Reduced Price and Increased Business at Cardiff.

The opening statement of the Chairman of the Cardiff Gas Company (Mr. Charles H. Williams), when moving the adoption of the report of the Directors at the recent half-yearly meeting, must have been particularly gratifying to the proprietors. It was to the effect that everything connected with the affairs of the Company was in a thoroughly healthy condition. He went on to say that last June considerable reductions in the charge for gas were made, which naturally affected the revenue; but, on the other hand, these reductions had stimulated the demand for gas, and a good increase in consumption was the result. In other directions also progress had been made, especially in the improved methods adopted by consumers of using gas for lighting their premises, thanks to the introduction of the incandescent burner, and especially the new high-power lamps, which had given an entirely fresh impetus to the methods of lighting. Consequently, the fitting account showed a largely increased amount of work done; and it was the intention of the Board to develop and encourage this branch of the business to the fullest extent, thereby ensuring to gas consumers the best possible lighting results. The prepayment meter system continued to increase very steadily; and at the present time the Company had upwards of 5800 installations completed and in full working order. Having received encouraging promises of support, the Chairman announced the intention of the Board to extend the lighting to the outlying districts at the earliest possible opportunity. The report was adopted, and the usual dividends were declared.

Trade Depression Affects Gas Consumption at Chester.

The report presented at the half-yearly meeting of the Chester United Gas Company last Thursday showed that there was a balance of £3985 to the credit of the profit and loss account; and the Directors recommended the declaration of a dividend of 2½ per cent. on the ordinary stock for the six months ending Dec. 31, making with the interim dividend 5 per cent. for the year. The payment of this would leave a balance of £56 to be carried forward. The Chairman (Mr. J. Gamon), in moving the adoption of the report and accounts, said the latter were not quite so satisfactory as he had hoped they would be, mainly owing to the depression of trade in the city and district, which continued to show its effect in the diminution in the consumption of gas outside the city, where the Company were not affected by any competition with electric light. This depression was also shown by the falling-off in the automatic meter receipts, on the average of each meter. The amount available for dividend was slightly less than last year, owing to the abolition of meter-rents, which were made a present of to the consumers. The total cost of the retort-house alterations was £16,379, of which £11,377 had been repaid out of revenue during the last 4½ years. It was a very creditable performance. There had been a diminution in the sales of gas this year to the extent of 4 million cubic feet, which was attributable to bad trade. Notwithstanding this decrease, they had extended their mains to Upton, Hough Green, and Littleton; and 394 additional automatic meters had been supplied. Having got rid of the heavy charge in respect of the retort-house, they had been able to reduce the price of gas by 2d. per 1000 feet; and the value of this reduction to consumers, in conjunction with the abolition of meter-rents announced twelve months ago, was £2380. He read over the terms on which gas was now supplied, showing that the price was only 2s. 11d. per 1000 cubic feet, less 1d. discount to all consumers. Large consumers received from 2d. to 6d. per 1000 feet; the price of gas used in engines being 2s. net. Cookers were rented at from 1s. per quarter; while gas-fires on hire and purchase were supplied at from 2s. 6d. The Chairman concluded by alluding to the satisfactory working of the profit-sharing scheme, one gratifying effect of which was, he said, increased zeal, efficiency, and economy among the workmen. He thought the Company reaped the full benefit of the money paid in bonuses to the employees. The report was adopted, and the dividend recommended was declared.

Big Breakages of Mantles at Durham.

An interesting statement was made by the Chairman of the City of Durham Gas Company (Mr. John Coward, J.P.), in the course of his address to the shareholders at the annual meeting last week, with reference to the lighting of the public lamps on the incandescent

system. He said that the conversion had proved a much more costly business for them than they had anticipated; for already four nights had been so windy that they had had to replace 924 mantles, or about 230 per night. Certainly this seems a large number out of 351 single-burner and 13 four-burner lamps—or a total of 403 incandescent burners. It is, however, gratifying to learn that the Company are satisfied with the terms upon which they have secured the lighting. The report which was adopted stated that there had during the twelve months been an increase in the sale of gas by meter of 3,331,500 cubic feet, chiefly due to the extended use of gas-stoves. Dividends at the rate of 10 per cent. per annum on the original and 7 per cent. on the additional capital were declared, leaving a balance of £769, of which £250 has been carried to the reserve fund.

Extended Gas Supply at Newport (Mon.).

The Chairman of the Newport (Mon.) Gas Company—Mr. R. Laybourne—when moving the adoption of the report of the Directors at the half-yearly meeting on Monday last week, remarked that the reduction made in the price of gas had only affected the October to December quarter. They had sold nearly 6 million cubic feet more gas than in the corresponding half of 1903; giving an increase of £704 in the receipts. More gas-fittings than usual had also been sold. There was a continued demand for prepayment meters, of which 7941 were now in use, as well as 9640 cookers, 2554 gas-fires, and 127 gas-engines. In addition to the prepayment meters, there are 3952 of the ordinary kind; making a total of 11,893 in use in the 12,530 houses in the borough. A flourishing gas undertaking is always a good mark for an Assessment Committee; and the rule holds good at Newport. The Chairman stated that expenditure to the amount of £547 had been incurred in the past half year owing to an unwarranted attempt to increase the assessment of the Company's properties from £5200 to £8000. The Company resented this, and appealed to the Assessment Committee, from whom no redress was gained, and so it was found necessary to appeal to Quarter Sessions. The result was that the Company had £1200 taken off the new assessment proposed. Although this was accepted, it was only a compromise. The Company considered it very inadequate; but for the sake of peace and quietness, and to save the ratepayers further large expenditure in litigation, they agreed to it. In this case the ratepayers had to pay the costs on both sides; and those of the Assessment Committee were probably more than the Gas Company's. The effect was that the latter were prevented making a further reduction in price. The Chairman concluded by referring to the places where incandescent gas lighting has displaced the electric light, and expressing the opinion that there are brilliant prospects for the older illuminant. The report was adopted, and the usual dividends were declared. In returning thanks for a complimentary vote to the staff, the Engineer (Mr. T. Canning, Assoc.M. Inst.C.E.) said there was hardly a house in Newport worth living in that the Company had not supplied with gas. This showed the extent to which they had been spreading their wings in recent years.

Gas Holds its Own in York.

The Chairman of the York United Gas Company (Mr. J. R. Hill) made a reassuring speech in moving the adoption of the report at the half-yearly meeting of the Company on the 2nd inst. There was good reason for this, as the document referred to contained the statement that 1473 yards of additional mains had been laid, 728 meters put in for new consumers, and 670 additional cookers, 220 gas fires and boilers, and 1853 lights fixed by the Company's workmen beyond those supplied by other gas-fitters; while the quantity of gas sold during the entire year had been upwards of 4 million cubic feet more than in 1903. The balance carried to the profit and loss account was £8070; and there was £8287 available for distribution. The Directors recommended the allocation of this sum as follows: Payment of interest at the rate of 3½ per cent. per annum (less income-tax), on £25,000 borrowed on mortgage; payment of dividends at the rate of 4 per cent. per annum (less income-tax), on the preference and consolidated ordinary stocks; and the carrying forward of the balance (£81). The Chairman pointed out that they had earned sufficient to pay their usual dividend and leave a small surplus; but, he said, the latter half of the year was the lean one for profit, and the two half years had to be read together. If this was done, they found that the surplus for the year was £1133. Treating the quantity of gas sold in a similar way, they were able to report an increase over the year 1903 of upwards of 4 million cubic feet; and this had happened in a year during which they had had unusually fine weather, especially in the autumn. The general business had continued to grow steadily. These were results which the Directors ventured to regard as satisfactory, and he trusted they would present themselves to the stockholders in the same light. It was always an important concern to a business man to know how he compared with his competitor, and they naturally watched with keen interest the struggle between their industry and its rival, the electric light. He then referred to a communication they had received from the Gaslight and Coke Company, to the effect that during the past year or so they had installed incandescent gas lighting in some hundreds of business premises in lieu of electricity; and that more than 100 public-houses had come back to them, and many shops of all descriptions. Their biggest "score," however, so far, was the Victoria Terminus of the London, Brighton, and South Coast Railway, where they turned out all the arc lighting in December, 1903, and enabled the Company to save over £1000 last year as a consequence. He also gave the proprietors some extracts from the article in the "Lancet" which appeared in our columns on the 29th of November. He concluded by expressing the satisfaction of the Directors at observing that gas stocks had shared in the general improvement which had taken place in the value of investments. The report was adopted.

Maximum Dividends and Profit-Sharing at Wallsend.

At the annual meeting of the Walker and Wallsend Union Gas Company last Friday, the Chairman (Colonel T. Crawford), in moving the adoption of the annual report and balance-sheet, extracts from which were given in the "JOURNAL" on the 31st ult. (p. 297), said that in many respects they were the most favourable in the history of the Company. The gas sold beyond that of the previous year was 34¼ million cubic feet, or 16 per cent.; being the largest sale and increase obtained in any one year. The consumption for lighting and heating had increased 9·74 per cent. The number of consumers added during the twelve months was made up of 71 ordinary meter consumers and 3040 prepayment installations. The large increase in the number of consumers and gas sales had caused a corresponding increase in the expenditure of capital to meet public requirements. Up-to-date plant had been put in at the Walker works, and improvements had been effected in those at Willington Quay. The result of the working was a satisfactory revenue profit of £7877. The dividends proposed—viz., £4 17s. 6d. upon the 3½ per cent. stock and £6 7s. 6d. upon the 5 per cent. stock—were the maximum authorized in accordance with the Company's sliding-scale; the rate being increased owing to the reduction in the price of gas on Jan. 1, 1904, from 2s. 6d. to 2s. 3d. per 1000 cubic feet. The results of the year more than justified the policy of the reduction, and pointed very hopefully to the prospects of the Company. Regarding the reduction of the illuminating power from 15½ to 14 candles, the provision of the 1903 Act was that the compensation for supplying 14-candle gas was that the price had to be reduced 1d. It had been contended that, in opposition to the reduction in the illuminating power, the consumers would burn more gas than formerly. This had proved another fallacy, as ordinary meter consumers, although increasing in numbers, consumed 4½ per cent. less last year than in 1903. In conclusion, the Chairman mentioned that the Directors, following the system of other companies, had created a scheme of premiums or profit-sharing to the staff. It was possible for all to earn up to about 5 per cent. upon their respective salaries; and the results had been satisfactory to the Company. In conjunction with the bonus scheme, a fidelity and guarantee insurance fund had been created; and this obviated the necessity of having to protect the Company with insurance companies at increased cost. The report was adopted, and the dividends recommended were declared.

NO REDUCTION OF PRICE AT DONCASTER.

The question of the price of gas once more engaged the attention of the Doncaster Town Council on Wednesday, when Mr. Ellis moved the non-confirmation of a minute recommending that from April 1 the charge should be reduced 2d. per 1000 cubic feet—that is, from 2s. 6d. to 2s. 4d. In doing so, he remarked that the Corporation had a perfect right to make a legitimate profit on their undertaking; and he failed to see that the present price was prohibitive. A reduction of 2d. per 1000 cubic feet was not worthy of consideration. Alderman Clark, who seconded, assured the Council that it was not sought to put any slight on the Gas Committee; but it was a question which affected the whole finances of the borough, and one which the Council should deal with as a whole. Shortly, they would have to pay £2600 per annum extra for water; and this was a matter for their consideration. They needed all the profits they could get from any source to keep down the burden laid upon the town by the water-works. None of the increased cost incurred by the water-works extension would fall upon the shoulders of the outsiders, who nevertheless would receive the benefits. During the coming year the deficit on the water would be £7150, which would have to be paid entirely by the inhabitants of the borough. Had the price of gas been exorbitant, he would not have objected; but they were 1s. below the maximum allowed to be charged, and he thought this was exceedingly reasonable to the consumer.

Mr. Armitage described as "outlandish" the remark of Alderman Clark as to the deduction affecting the whole of the finances. The gas profits did not come from people visiting the town once a year, but were derived from the payments of poor struggling tradesmen. The arguments used were not analogous. The gas cost the Corporation 1s. 8⅛d. per 1000 cubic feet to produce. Mr. Clark said if they drove their ideas to extremes, they would become untenable. Figures showed that they made an annual profit of £4000 on the gas, and that even if the price was reduced, as proposed, the profit would remain practically the same, owing to increased consumption, which would lower the cost of production. Had this not been so, he would have agreed with the mover of the non-confirmation of the minute. Still, was it right that the gas-works should go on contributing so unfairly, in such large proportion, to the borough fund, compared with their undertaking of of a competitive character to the gas? They desired to make their commodities available for the benefit of even the poorest burgess. Mr. Wightman pointed out that even with the reduction there would be a profit of 7½d. per 1000 cubic feet; while the Chairman of the Gas Committee urged that the consumers should not be made to pay more than a legitimate price.

On a division being taken, the voting was equal; and the Mayor thereupon gave his casting vote in favour of the non-confirmation of the minute, which means that the gas will remain at its present price.

Water-Works Extensions at New Brighton.—A new reservoir and water-tower for the purpose of supplying the higher portions of New Brighton have just been completed, and will be formally opened next Saturday. The work has been carried out from the designs of Mr. J. H. Crowther, Gas and Water Engineer to the Wallasey Urban District Council. The site selected for the reservoir was of a rocky nature; and 28,000 yards of rock were excavated. The dimensions are 312 feet in length with an average width of 120 feet and depth of 20 ft. 6 in., giving a capacity of 4¼ million gallons. It is lined throughout with bitumen sheeting. The tower, which is octagonal in shape, with a spacious platform on top, is built of red Runcorn stone, partly faced with brickwork inside. The tank, which is placed about 60 feet above the roadway, has a capacity of upwards of 70,000 gallons, and is served by a 21-inch pipe leading from the Vyrnwy supply, and also by an 18-inch pipe from the pumping-station at Liscard, both of which can be run direct into the reservoir if required. The supply of the district from the tank is taken from the 18-inch pipe by a 9-inch pipe; and the tank overflows from a 24-inch pipe into the reservoir.

MR. HENRY AUSTIN ON CO-PARTNERSHIP.

On Thursday evening, at the St. Mary's Institute, Greenwich (the Rev. S. Bardsley in the chair), Mr. Henry Austin, one of the Workman Directors of the South Metropolitan Gas Company, delivered a lecture to an appreciative audience of working men on "Co-Partnership."

After speaking briefly of the highly successful experiments on profit-sharing and co-partnership of Le Clare, of Paris, and Godin, of Guise, and other smaller but thoroughly successful arrangements in England, Mr. Austin dealt with the system of the South Metropolitan Gas Company initiated in 1889, by which the sliding-scale, originally introduced by Sir George Livesey to regulate the price of gas and the profits of the shareholders, was extended to the workmen. This system, which upsets all previous ideas of business, provides that the lower the price of gas to the consumer the higher shall be the dividend of the shareholder and the larger the bonus of the workmen. How was it done? By economy of management, by the introduction of the latest and most improved machinery, and, last, but not least, by the thoughtful, cheerful, and energetic labour of the workers; so that gas was now sold at 2s. per 1000 cubic feet—being the lowest price ever reached in London. The shareholders were receiving a higher dividend than ever before; while since the introduction of the system in 1889, £263,000 had been paid to the workmen in bonuses, their wages being during the whole time as high as those paid for the same kind of work by any other London Company. It had been said workmen were not thrifty, and would not save. But the workman's want of thrift was due to the want of opportunity—his wages left little or nothing after providing for his daily needs. When, however, by co-partnership the opportunity was given him, he would, and did, save, as was proved by the fact that nearly £250,000 of the workmen's bonuses and savings was now invested in the Company's stock, while others with their savings had bought their own houses, entered into business, and in other ways permanently benefited themselves.

Mr. Austin then went on to show how the system had grown, how year by year the workmen's investments had increased, how there were now 4000 workmen shareholders in the Company holding stock varying from £5 to £500 in value. Think, he said, what this means to the workman. If he has only £5, should misfortune overtake him it means five weeks from want, from charity, or the workhouse; while if he has (as many now have) £100, he has two years in which to recover and reinstate himself, without having to forget his independence. Should he live to grow old, there is something for his old age, so that he may end his days in peace and comfort; while should he die while yet a worker, there is something to help those whom he leaves behind him. It had been said, continued the lecturer, that the system of saving made a man narrow, selfish, and careless about the welfare of his fellows; but this was not true. On the contrary, it made him more thoughtful for others, and more ready to help. But the benefits of the system did not end here. It had solved the apparently insoluble difficulty between Capital and Labour. Where the worker was only a wage earner, he often felt that he was not getting fair payment for his labour; and therefore he was discontented with his employers. But when he shared in the profits of the business, this cause of discontent was removed, because he knew that he would receive a fair share of the earnings of the business, and the larger the profits made the larger would be his share of them. And not only thus did it benefit him. It not only provided for the future, but it sustained his spirit of healthy independence, taught him to think, educated him in business and business habits, and made him a better worker, a better citizen, and a better man. All this was due to the efforts of one true friend of the working man—Sir George Livesey; and no words of his could adequately describe the feeling of gratitude and affection with which the employees of the Company regarded their Chairman.

In conclusion, Mr. Austin said that wherever the principle of co-partnership was adopted, the humane faculties were developed. Why? Because the worker was brought into touch with a living force, a force that had lain dormant under the cumbersome burden of hatred and ill-well toward Capital and the Capitalist. It had benefited the worker, and vitalized him into a new being full of hope and energy for life's battle.

Mr. Drumgold, the Staff Employees' Director of the Company, explained the system. He said that any man employed by the Company could apply at the office for a form of application to be allowed to become a co-partner. This form, when filled up, was submitted to the foreman; and if it was found that the man was a useful worker who could be retained, he was allowed to sign the agreement, by which he undertook to work for the Company for a stated time, while the Company guaranteed to find him constant work during that period without any reduction of wages. Having signed the agreement, he became a co-partner, and as long as he remained one was entitled to a share of the profits, which are calculated on the selling price of gas. If the price is 3s. 1d. per 1000 cubic feet, he gets no bonus; but for every 1d. under this price he receives ¾ per cent. So that at the present price he gets in bonus an increase of 9 per cent. on his wages. Of this sum, one-half must be invested in the Company's stock. The other half is withdrawable; but the men are encouraged to invest the whole amount, as the chief object of the system is not to provide spending money for the present, but provision for the future. Should the workman leave fater the agreement expires, he is at once paid such share of bonus as may have been earned since the last distribution; while his stock he can realize at full market value or retain, as he thinks best. At the same time, every effort is made to find constant employment for signed men by keeping over what work is possible in the busy season for execution in the slack part of the year.

Mr. Charlton said the chief beauty of the scheme was that it taught men self-reliance and self-control; and he spoke of the many benefits derived from the principle of co-partnership. There were the sick and burial funds, to which the men paid 3d. per week; the Company contributing an equal or larger amount if required. Then there was the accident fund, to which the workman contributed 2d. per month, and the Company 1s. per quarter for every man employed; and this fund enabled them to provide for the widow and children of anyone killed, and to pay to those injured a sum varying from 12s. to 25s. per week. The smaller sum was paid in case of accidents due to men's own fault; while the higher rate was paid where the accident was due to any fault in the plant or working. In cases of pure accident, for which no one was to blame, an intermediate sum was paid. This was continued, not for a few weeks, but until the man recovered, no matter how long that might be. The question to which class each case should belong was decided by a jury of twelve other workmen, who, without direction from any officer, decided each inquiry on its merits. Then there was the pension fund, to which a man could contribute 3d. per week. If he left, the money was returned in full; while if he continued to work for the Company until he reached the pension age he received from 12s. to 17s. per week, according to length of service.

Rev. W. Campbell made some laudatory remarks on Sir George Livesey and the system; and the meeting ended with a very hearty vote of thanks to Mr. Austin.

THE MANCHESTER GAS UNDERTAKING.

Some Big Figures.

The Association of Manchester Students of the Institution of Civil Engineers had laid before them on Wednesday, by Mr. J. G. Newbigging, the Gas Engineer to the Corporation, some very interesting figures with regard to the undertaking of which he has charge.

Going back first of all to early times, Mr. Newbigging remarked that, for the purposes of local government prior to 1828, Manchester and Salford were united; and just a hundred years ago, the mill of Messrs. Phillips and Lee, in Chapel Street, Salford, was successfully lighted with gas. In 1828, the price of gas was 12s. per 1000 cubic feet; and in 1843, when the powers and duties of the Commissioners were taken over by the Corporation, the charge was 6s. In the 61 years that the gas undertaking has been municipal property, the gross profits, after providing for depreciation, have been £5,297,986, of which £2,629,301 has been applied in aid of rates and other departments. The gas-works and properties of the department cover an area of nearly 81 acres; the annual income is over £750,000; and it is claimed that the financial position of the undertaking is second to no other similar concern in the kingdom. Since 1843, the amount contributed in relief of the rates has averaged £43,000 a year. Sixty years ago, the output of gas was 248 million cubic feet per annum; and last year it reached 4994 million cubic feet—the total number of consumers being 146,457.

The number of public lamps for the lighting of the whole area of supply—47½ square miles—is 19,031. Of these, nearly 4000 are fitted with incandescent burners; and the remainder will be gradually converted. Electricity is, says Mr. Newbigging, eight times dearer than gas, light for light, at Manchester prices. The number of Corporation stoves in use is nearly 18,000; and last year £52,781 was collected in pennies—weighing 113 tons—from 44,341 penny-in-the-slot meters. In the manufacture and distribution of gas, 1954 persons are employed. With a view to meeting the needs of the future, the Gas Committee in December, 1903, secured powers to borrow £1,000,000 for the purposes of the undertaking during the ten years 1905 to 1915, to be applied as follows: New works of a capacity of 12 million cubic feet at the Bradford Road Station, £431,000; reconstruction of the retort-house, at the Gaythorn station, £43,200; new mains, £135,000; new service-pipes, £80,000; new meters, £160,000; new cookers, £150,000.

REDUCTION FOR LARGE CONSUMERS AT LINCOLN.

Some exception was taken by two members at last Tuesday's meeting of the Lincoln City Council to a recommendation of the Gas Committee to allow all consumers whose consumption shall in any year ending March 31 exceed 6 million cubic feet a discount of 7½ per cent. on the current price of gas.

The first of these gentlemen (Mr. Bell) said he voted against the proposed reduction in committee, as he was given to understand that the price of gas would not warrant a discount of 7½ per cent., and he maintained they were not doing justice to the small consumers if they gave such a large concession to the big firms. They could no more do without small consumers than without the large ones. In fact, they could do better without the large ones than without the small consumers. The laughter caused by the last remark having subsided, Mr. White also spoke against the reduction; observing that a large number of the shareholders of the engineering firms were not ratepayers of the city. Alderman Wallis said the Committee received a letter some time ago from Messrs. Robey and Co.; and the contents were discussed. They considered whether they could reduce the price of gas all round, and decided to do so by 2d. per 1000 feet, and that for twelve months they would not decide the question of preferential rates to the large consumers. These twelve months, however, had not expired when they had a letter from Messrs. Clayton and Shuttleworth. It was to the effect that the firm were making their own gas; but the Directors were prepared, if the Gas Committee would make some reduction, to give up doing so, and take the gas they required from the Corporation. He (Alderman Wallis) explained the matter to the Committee; and figures were prepared by the Manager, Mr. J. Carter, showing a considerable profit. It was thereupon decided to reduce the price to the large consumers provided they took 6 million cubic feet per year. The small consumers had received benefit from the quantity used by the large ones; and but for the latter, they would have more to pay for their gas.

The Committee's recommendation was adopted.

HIGH-PRESSURE GAS-LAMPS IN WESTMINSTER.

Last Wednesday, the Works Committee of the Westminster City Council reported that the Gaslight and Coke Company had offered to light, cleanse, maintain, and extinguish all the high-pressure lamps at (A) Wellington Street, Strand, and (B) in front of the Law Courts, as follows: Lighting, cleansing, and extinguishing per annum (A) £1 10s., (B) £3 10s.; maintenance, repairs, and painting (A) £1 10s., (B) £1 10s.; maintenance of mantles (A) 15s., (B) 15s.; maintenance of pressure apparatus (A) £5, (B) £5. The Company further offered to connect the lamps to the Aldwych high-pressure system, the cost, including the necessary burners, mains, subway charges, &c., being £42 6s. 6d., exclusive of the cost of repairing after laying the necessary supply-pipes. The difference of £2 between the charge for lighting, cleansing, and extinguishing the lamps at Wellington Street and opposite the Law Courts was due to the large type of lamp in use at the latter place. Instructions had been given to the City Engineer (Mr. J. W. Bradley, M.Inst.C.E.) to go into the question as to whether it would be possible to arrange for the same type of lamp to be used at both places. Subject to this, the Committee had decided to accept the Gas Company's offer, both as regards the lighting, &c., of the lamps and the proposed connection to the Aldwych high-pressure system.

BURSTING OF THE VYRNWY WATER-MAIN.

During the early hours of Friday week, the 42-inch main which conveys to the city water from the Vyrnwy reservoir of the Liverpool Corporation burst at the village of Eaton, near Tarporley, in Cheshire. It is estimated that something like 22 million gallons of water were liberated, and it swept over the surrounding country, doing considerable damage. The roads were affected for a distance of 400 yards; the water running in deep channels and rendering them impassable. The occurrence happened at a time when the roads were clear of traffic, and loss of life was averted. Another circumstance of importance was the efficiency of the automatic alarms. These immediately aroused the attendants along the line, who promptly shut off the supply, and reduced the head of water, thus curtailing the damage. The City Water Engineer (Mr. Joseph Parry, M.Inst.C.E.) left Liverpool for Cheshire in the course of the morning to superintend the repairs. The main occupies an elevated position; and the burst is attributed either to a slowly extending flaw in the pipe, which was laid in 1891, or to land shrinkage, due to the laying of an additional main close by. Great commotion was caused among the inhabitants by the occurrence; but fortunately the village stands on rock, or the flooding might have resulted in the washing away of some of the houses. Owing to the emptying of the local reservoir, the accident occasioned some inconvenience at Tarporley and one or two other places in Cheshire whose water supply is obtained from Vyrnwy; but Liverpool itself was in no way affected—the reservoirs at Prescot being more than adequate to meet a contingency of this character. The repairs were completed the following day. It is stated that the Corporation will accept the responsibility for the entire damage caused by the bursting of the main.

NOTES FROM SCOTLAND.

From Our Own Correspondent.

Saturday.

It cannot be said that the death of Mr. A. Smith, of Aberdeen, was at all unexpected, for he has been for about two years in such a state of health that the end might have been looked for any day. Yet now when it has come, the regret is none the less keen in that the event was inevitable. In an obituary notice in another column, it is stated that Mr. Smith learned the trade of an engineer. We are now told, and I think experience has shown it to be true, that engineers make the best gas managers. That being so, it follows that the Corporation of Aberdeen were in advance of the time when they appointed an engineer to manage their gas undertaking. It will be admitted by all who know the gas-works at Aberdeen that Mr. Smith fully justified their choice. I have said before, and am free to repeat it, that in no place I have been in have the gas-works exhibited more convincing proof of "thorough" management. The buildings, solidly built of granite, were erected long before there was any notion of stoking by machinery; yet, as if by prophetic instinct, when stoking machinery came in, there was room for it in the retort-houses, which is more than can be said of most places. This is but one out of many examples which might be given of Mr. Smith's work. One of his characteristics, as a matter of fact, was foresight. There is another feature of the working of the Gas Department in which I have no doubt Mr. Smith had a share, if he had not the entire control. That is the handling of the capital account. Having acquired the gas undertaking in 1871, the Corporation set themselves to the task of reducing the capital. In this they have been successful to the extent of about one-third of the original account, and that, too, in face of a continuously increasing demand for extensions of works. There is no need to say more. Mr. Smith was one of the foremost men in his line. He was broad in his ideas, as well as far-seeing, for when the Corporation adopted electricity as an illuminant, it was upon his advice that they relied in the working out of the scheme; and he worked as heartily for electricity as he had done, and continued to do, for gas. Of his family of six sons, two are already in the management of gas-works in Scotland, two are in electricity works, and the remaining two are professional gentlemen; and so we have the satisfaction of knowing that, while all are well placed, the connection of the family with the gas industry is to remain unbroken by his death.

The meeting in Glasgow this evening of the Scottish Junior Gas Association (Western District) was a very large one, from which may be gathered that the members of the Association are as full of enthusiasm for the movement as when it was initiated. There is no lack of members who are willing to come forward with subjects to discuss. We had a new experience to-night in the writers of both papers applying the rein, and really writing a great deal less upon their respective subjects than they might have done. That is as it should be; and I am sure anyone who reads the discussion will admit that it did not suffer in any degree from the curtailment. As was pointed out, it is open to anyone to ask information upon any point not dealt with in the paper. Mr. Webster's description of the coal and coke handling plant at Provan was a lucid and detailed account of the application of labour-saving machinery in gas-works. The question was raised as to its adaptability

GAS COMPANIES' STOCK AND SHARE LIST.

Referred to on p. 416.

Issue.	Share.	When Dividend.	Dividend or Dividend & Bonus.	NAME.	Closing Prices.	Rise or Fall in Wk.	Yield upon Investment.
£			p.c.				£ s. d.
590,000	10	Oct. 13	10½	Alliance & Dublin 10 p.c.	21½—22½	..	4 13 4
100,000	10	,,	7½	Do. 7 p.c.	14½—15½	..	4 16 9
200,000	5	Nov. 11	6½	Bombay, Ltd.	6¼—6¾	..	4 16 4
140,000	5	,,	6½	Do. New, £4 paid	4¾—5¼	..	4 19 1
50,000	10	Aug. 31	14	Bourne- 10 p.c.	29—30	..	4 13 4
251,810	10	,,	7	mouth Gas B 7 p.c.	16—17	..	4 2 4
53,200	10	,,	6	and Water Pref. 6 p.c.	14½—15½	..	3 17 5
380,000	Stk.	Aug. 12	12	Brentford Consolidated	250—255	..	4 14 1
300,000	,,	,,	9	Do. New	190—195	..	4 12 4
50,000	,,	,,	5	Do. 5 p.c. Pref.	130—135	..	3 14 1
206,250	,,	Dec. 15	4	Do. 4 p.c. Deb.	105—108	..	3 14 1
220,000	Stk.	Sept. 15	11	Brighton & Hove Orig.	228—233	..	4 14 5
246,320	,,	,,	8	Do. A. Ord. Stk.	168—173	..	4 12 6
400,000	20	Sept. 29	10	British	41—42	..	4 15 3
100,000	Stk.	Aug. 12	6	Bromley, Ord. 5 p.c.	117—122	..	4 18 4
165,700	,,	,,	4½	Do. do. 3½ p.c.	92—95	..	4 13 9
500,000	10	Oct. 13	7	Buenos Ayres (New) Ltd.	11½—12	..	5 16 8
250,000	Stk.	Dec. 30	4	Do. 4 p.c. Deb.	93—95	..	4 4 3
150,000	20	July 14	8½	Cagliari, Ltd.	24—26	..	6 6 11
100,000	10	Sept. 29	10	Cape Town & Dis., Ltd.	16½—16¾	..	5 19 5
100,000	10	Oct. 27	4½	Do. 4½ p c Pref.	9½—10	..	4 10 0
50,000	50	Nov. 2	6	Do. 6 p.c. 1st Mort.	52—54	..	5 11 1
50,000	Stk.	Dec. 30	4½	Do. 4½ p.c. Deb. Stk.	100—102	..	4 8 3
1,400,000	Stk.	Aug. 31	5⅛	Commercial 4 p c Stk.	117—120	..	4 6 8
560,000	,,	,,	5	Do. 3½ p.c. do.	113—116	..	4 6 2
450,000	,,	Dec. 15	3	Do. 3 p.c. Deb. Stk.	86—88	..	3 8 2
800,000	Stk.	,,	6½	Continental Union, Ltd.	117—120	..	5 8 4
200,000	,,	,,	7	Do. 7 p c. Pref.	140—145	..	4 16 7
424,070	Stk.	Aug.	5½	Derby Con. Stk.	124—125	..	4 8 0
55,000	,,	Jan. 3	4	Do. Deb. Stk.	108—110	..	3 12 9
486,090	10	Jan. 27	11	European, Ltd.	21—22	..	5 0 0
354,060	10	,,	11	Do. £7 10s. paid	14½—15½	..	5 6 6
15,243,200	Stk.	Feb. 10	4⅛	Gas- 4 p.c. Ord.	93—101*	+2¾	4 7 1
2,600,000	,,	,,	3½	light 3½ p.c. max.	91—93*	..	3 15 3
3,799,735	,,	,,	4	and 4 p.c. Con. Pref.	108—110*	..	3 12 9
4,193,975	,,	Dec. 15	3	Coke 3 p.c Con. Deb.	87—89	..	3 7 5
258,740	Stk.	Sept. 15	5	Hastings & St. L. 3½ p.c.	103—103	..	4 17 1
70,000	10	Sept. 29	11	Hongkong & China, Ltd.	16—17	..	6 9 5
3,800,000	Stk.	Nov. 11	10	Imperial Continental	210—212	..	4 14 4
473,600	Stk.	Feb. 10	3½	Do. 3½ p.c. Deb. Red.	95—97*	+¾	3 12 2
175,036	Stk.	Aug. 31	6	Lea Bridge Ord. 5 p.c.	118—123	..	4 17 7
561,000	Stk.	Aug. 31	10	Liverpool United A.	224—226	..	4 8 6
718,100	,,	,,	7	Do. do. B.	162—164	..	4 5 4
306,083	Stk.	Dec. 30	4	L'rpool Unit'd Deb. Stk.	107—109	..	3 13 5
75,000	5	Dec. 15	5	Malta & Medn., Ltd.	4—4½	..	5 11 1
560,000	100	Oct. 1	5	Met. of 5 p.c. Deb.	103—105	..	4 15 3
250,000	100	,,	4½	Melbourne 4½ p.c. Deb.	102—104	..	4 6 7
541,920	20	Nov. 11	3⅜	Monte Video, Ltd.	10½—11½	+⅛	6 1 9
1,565,892	Stk.	July 29	4⅜	Newc'tle & G'tesh'd Con.	108—109½	−¼	4 4 6
406,625	Stk.	Dec. 30	3⅜	Do. 3½ p.c. Deb.	90—92	..	3 16 1
15,000	10	Aug. 31	10	North Middlesex 10 p.c.	19½—20½	..	4 17 7
52,940	1	,,	7	Do. 7 p.c.	13½—14½	..	4 16 7
300,000	Stk.	Nov. 30	8	Oriental, Ltd.	148—151	..	5 6 0
600,000	5	Sept. 15	7	Ottoman, Ltd.	5½—6½	..	5 12 0
235,005	Stk.	—	6½	Plym'th & St'house 5 p.c.	—	..	—
398,490	5	Apl. 28	5	Primitiva Ord.	5½—6	..	4 3 4
796,980	5	Jan. 27	5	Do. 5 p.c. Pref.	4¾—5¼	..	4 15 3
488,900	100	Dec. 1	4	Do. 4 p.c. Deb.	94—96	..	4 3 4
851,070	10	Oct. 13	7	River Plate Ord.	12½—12¾	..	5 9 10
300,000	Stk.	Dec. 30	4	Do. 4 p.c. Deb.	94—96	..	4 3 4
250,000	10	Sept. 15	6	San Paulo, Ltd.	12—12½	..	4 16 0
70,000	50	Jan. 3	5	Do. 5 p.c. Deb.	52—54	..	4 12 7
135,000	Stk.	Sept. 15	10	Sheffield A	238—240	..	4 3 4
203,984	,,	,,	10	Do. B	237—239	..	4 3 8
523,498	,,	,,	10	Do. C	236—238	..	4 4 0
123,998	Stk.	Sept. 29	5	Shrewsbury Ord. 5 p.c.	104½—107½	..	4 13 0
70,000	10	,,	11	South African	16—17	..	6 9 5
6,250,000	Stk.	Feb. 10	5⅜	South Met., 4 p.c. Ord.	127—129*	..	4 5 3
1,832,700	,,	Jan. 13	3	Do. 3 p.c. Deb.	88—90	..	3 6 8
575,000	Stk.	Aug. 31	5½	S'th Suburb'n Ord. 5 p.c.	123—126	..	4 7 4
60,000	,,	,,	5	Do. 5 p.c. Pref.	125—130	..	3 16 11
112,533	,,	Jan. 13	5	Do. 5 p.c. Deb. Stk.	130—135	..	3 14 1
502,310	Stk.	Nov. 11	5	Southampton Ord.	106—109	..	4 11 9
87,950	,,	—	4	Do. 4 p.c. Deb.	—	..	—
120,000	Stk.	Aug. 31	6¾	Tottenham A 5 p.c.	123—128	..	4 17 8
325,520	,,	,,	4¾	and B 3½ p.c.	97—102	..	4 13 2
115,000	,,	Dec. 15	4	Edmonton 4 p.c. Deb.	102—105	..	3 16 2
182,380	10	,,	8	Tuscan, Ltd.	8¾—9¼	..	8 13 0
149,900	10	Jan. 3	5	Do. 5 p.c. Deb. Red.	94—96	..	5 4 2
30,000	Stk.	Aug. 31	7½	Wands- A 5 p.c.	160—165	..	4 13 11
255,636	,,	,,	6¾	worth B 3½ p.c.	133—138	..	4 10 7
60,000	,,	,,	5⅞	and C 3½ p.c.	110—115	..	4 13 6
57,564	,,	Dec. 30	3	Putney 3 p.c. Deb. Stk.	77—82	..	5 13 2
745,872	,,	Aug. 12	5	West Ham 5 p.c. Ord.	103—105	..	4 15 3
85,000	,,	,,	5	Do. 5 p.c. Pref.	122—127	..	3 18 9
160,000	,,	Dec. 30	4	Do. 4 p.c. Deb. Stk.	105—110	+4	3 12 9

Prices marked * are Ex div.

in the case of small works, which, in the circumstances, was out of the question, because everyone knows that Mr. Webster never meant that such plant could be economically operated in small works, and that he read the paper, not with a view to recommending it to managers of small places, but for the benefit of those of his hearers who may, some day, be in charge of large works. Imagine a lecturer upon the Forth Bridge being asked by a hearer if he would recommend the cantilever principle for the bridging of the Kelvin. This illustration shows how very easy it is to pass from the sublime to the ridiculous; and it follows that much less good is done in a discussion by the bringing forward of such notions than by helpful remarks like those which fell from Mr. J. M'Leod in the discussion of Mr. Mackay's paper. This paper, by the way, was framed more with a view to the bringing out of the theoretical than the practical. At least, that was its effect; and in this respect it filled a useful place, coming, as it did, after the altogether practical one by Mr. Webster. The Association have still another meeting this session, and I suppose it may be of assistance to some if I mention that, on account of its clashing with an event which was not foreseen at the time the syllabus was made up, it has been postponed to a date to be fixed by the Council.

The smells complained of as coming from the Granton Gas-Works were brought to the notice of the Leith Town Council on Thursday in a slightly different aspect from what we have hitherto been accustomed to. The Public Health Committee reported that they had received a letter from Mr. G. G. Pattison, jun., W.S., dated Dec. 23, upon the question. When the letter came before the Public Health Committee, it was moved that it be sent to the Town Clerk for a report; and this motion was carried by a majority as against a proposal to take no action. When the resolution was brought before the Town Council, it was proposed to send the matter back to the Committee, and this was agreed to; Provost Mackie remarking that it was a very important matter, and that he did not think the subject would suffer any harm by recommittal. The attempt was a somewhat astute one to get the Town Council of Leith to take action, thereby shifting the burden of what might prove to be an exceedingly costly prosecution off the shoulders of those who are complaining. It has failed in the meantime; but it may be heard of again, if the Committee are resolved to continue to give trouble.

I mentioned the report of the Directors of the Coatbridge Gas Company last week. The annual general meeting of the Company was held on Thursday. Mr. James Johnston, the Chairman, in moving the adoption of the report and balance-sheet, said they would be pleased to know that the Company were in a position to pay the same rate of dividend as last year; there having been a considerable increase in the consumption of gas—equal to 2½ million cubic feet. The value of bye-products had declined; but they were pleased to be able to continue the price of gas at 2s. 2d. per 1000 cubic feet. The motion was unanimously agreed to.

That electric lighting is not sailing in with flying colours, as it used to do some years ago, is well brought out by what took place in the Inverness Town Council on Monday. The Council had before them an offer by the North of Scotland Electric Light and Power Company, who are at present introducing the electric light into Inverness, to supply twenty street-lamps, at a cost of £16 each per annum. This would amount to a total of £320 per annum. The cost of lighting the same area at present with incandescent gas is £132 12s. The Watering and Lighting Committee—Mr. Duffy dissenting—recommended that they were not disposed to come to a decision with regard to the offer until they had had some practical demonstration of the two modes of lighting, and that, with this in view, the Committee recommended the Council to invite the Company, if they so desired, and at their own expense, to erect and light one or more of the class of lamps they proposed for the lighting of the streets, the Town Council reserving to themselves full power to accept or decline the offer; and that meantime the remit be continued to the Committee. In the Council, Mr. Duffy moved that the recommendation should not be adopted. He thought the proposal to instal the electric light was a scandalous and uncalled-for proposition, the adoption of which would cost the town something like £200 a year of unnecessary expenditure. The present lighting of Inverness, he found, by personal observation, compared very favourably with that of London, Glasgow, or the other large cities. The Council, by twelve votes to four, adopted the recommendation of the Committee, with the alteration that the Company be "permitted," not "invited" to carry out the proposed experiment.

CURRENT SALES OF GAS PRODUCTS.

LIVERPOOL, *Feb.* 11.

Sulphate of Ammonia.

Demand has been sustained, but it has not been sufficient to effect any marked improvement in values except at Leith, where £13 7s. 6d. per ton f.o.b. has been paid for prompt and February delivery. Notwithstanding that the colliery strike has extended itself to Belgium, Continental demand has rather gone off, so that the Hull price remains where it was a week ago. The closing quotations are £13 2s. 6d. per ton f.o.b. Hull, £13 5s. per ton f.o.b. Liverpool, and £13 7s. 6d. per ton f.o.b. Leith. In the forward position, £12 15s. per ton is reported paid for July-December delivery. For delivery over the spring months £13 10s. per ton is quoted, but so far no business at the price has transpired.

Nitrate of Soda.

This article is firm at 11s. 3d. to 11s. 6d. per cwt., according to quality, for prompt and spring delivery.

LONDON, *Feb.* 11.

Tar Products.

Markets are generally quiet; and there has been little or no demand during the past week. The position of benzol is unchanged.

CARBURETTED WATER-GAS APPARATUS

Merrifield—Westcott—Pearson Patents.

The Economical Gas Apparatus Construction Co., Ld.

W. H. PEARSON, Chairman.
W. H. PEARSON, Junr., Deputy-Chairman.
J. T. WESTCOTT, Manager.
L. L. MERRIFIELD, M.Inst.M.E., Engineer.

London Offices: 19, ABINGDON STREET, WESTMINSTER, S.W.
American Offices: TORONTO. TELEGRAPHIC ADDRESS: "CARBURETED, LONDON."

CARBURETTED WATER-GAS ENGINEERS.

The above Company have erected since 1893, or are now erecting, their Universal Type of Carburetted Water-Gas Plant at the following Gas-Works:—

	Cub. Ft. Daily.		Cub. Ft. Daily.		Cub. Ft. Daily.
BLACKBURN	1,250,000	ST. CATHERINES (Remodelled)	250,000	TONBRIDGE	300,000
WINDSOR ST. WORKS, BIRMINGHAM	2,000,000	KINGSTON, PA.	125,000	STRETFORD	500,000
SALTLEY WORKS, BIRMINGHAM	2,000,000	PETERBOROUGH, ONT.	250,000	OLDBURY	300,000
COLCHESTER	300,000	WILKESBARRE, PA.	750,000	TODMORDEN	500,000
BIRKENHEAD	2,250,000	ST. CATHERINES (2nd Cont)	250,000	SALTLEY, BIRMINGHAM (Third Contract)	2,000,000
SWINDON (New Swindon Gas Co.)	120,000	BUFFALO, N.Y.	2,000,000	YORK (Second Contract)	750,000
SALTLEY, BIRMINGHAM (Second Contract)	2,000,000	WINNIPEG, MAN.	500,000	ROCHESTER (Second Contract)	500,000
WINDSOR ST., BIRMINGHAM (Second Contract)	2,000,000	COLCHESTER (Second Contract)	300,000	NEWPORT (MON.)	250,000
HALIFAX	1,000,000	YORK	750,000	TOKIO, JAPAN	1,000,000
TORONTO	250,000	ROCHESTER	500,000	PERNAMBUCO (Brazil)	125,000
OTTAWA	250,000	KINGSTON, ONT.	300,000	MALTON	150,000
LINDSAY (Remodelled)	125,000	CRYSTAL PALACE DISTRICT	2,000,000	DULUTH, MINN. (2nd Cont.)	300,000
MONTREAL	500,000	DULUTH, MINN.	300,000	BROCKVILLE (ONT.)	250,000
TORONTO (Second Contract Remodelled)	2,000,000	CATERHAM	150,000	SMETHWICK	500,000
BELLEVILLE	250,000	LEICESTER	2,000,000	GRAVESEND	300,000
OTTAWA (Second Contract)	250,000	ENSCHEDE (HOLLAND)	150,000	NEWPORT MON. (Second Contract)	250,000
BRANTFORD (Remodelled)	200,000	BUENOS AYRES (RIVER PLATE CO.)	700,000	TORONTO (Third Contract)	750,000
		BURNLEY	1,500,000	TORONTO (Fourth Contract)	1,000,000
		KINGSTON-ON-THAMES	1,750,000	MONTREAL, ONT. (2nd Cont.)	1,800,000
		ACCRINGTON	500,000	HAMILTON, ONT.	400,000

LEEDS, 1,800,000 C. Ft. LEICESTER (2nd Cont.), 1,000,000 C. Ft. NEWCASTLE-ON-TYNE, 1,800,000 C. Ft.

AND, IN ADDITION, 6,950,000 CUBIC FEET DAILY; also Coal-Gas Plants at NELSON, B.C., CHATHAM, BERLIN, NAPANEE, OWEN SOUND, CALGARY, and WINNIPEG.

There are reported to be buyers at 9d. per gallon at outports, which price, however, was declined by makers, who are holding for 9½d. As regards London, an offer of 10d. for March-June delivery is reported to have been declined by refiners here, who do not care to sell forward, unless at an advance on present prices. Toluol and solvent remain in the same position; and there is really no business to advise. In creosote, there has been a little business doing in the Yorkshire district at 1¼d. per gallon; but the quantities were decidedly limited, as the larger makers will not accept this price. In Lancashire, however, 1$\frac{5}{16}$d. has been accepted, and in one instance business is reported at 1⅛d. for prompt. There appear to be several sellers in Manchester just at present—manufacturers probably being anxious to reduce their stocks; and the production is, of course, just now at its heaviest. There is no actual business in anthracene reported, although there have been several inquiries from the Continent. Manufacturers do not, however, seem at all inclined to sell for forward delivery except at a considerable advance on existing prices. Carbolic acid is quiet; and prices have a decidedly downward tendency. In the early part of the week business was done at 2s.; while later on 1s. 11d. is reported to have been accepted in more than one instance. Consumers will now only purchase at reduced prices; and they appear to be able to control the market, as there are several parcels going for which at present buyers decline to offer more than 1s. 11d. to 1s. 11½d., according to port of delivery. In crystals, there is nothing fresh to advise. There are reported to be several large inquiries from the Continent; but prices certainly do not improve. In pitch, business in South Wales is still very good, and several sales are reported for both prompt and forward delivery. Consumers are certainly short of supplies, as in many instances they are pressing for deliveries. As regards Belgium, the strike of the miners has certainly rendered business very difficult, and consumers decline to purchase anything for early delivery until the situation is more settled. There are, however, inquiries from the Charleroi district for delivery over the last six months of the present year; but consumers will only contract at a reduction on existing prices. The Lancashire district still continues to be the weakest market; and there are several parcels offering in the neighbourhood of Manchester for early delivery. Manufacturers are not, however, at present prepared to accept the prices offered by dealers, although should the market not show signs of an improvement at an early date, probably distillers will have to consider the advisability of reducing their quotations.

The average values during the week were: Tar, 18s. to 22s. 6d. Pitch, London, 34s. 6d. to 35s.; east coast, 33s.; west coast, 31s. to 31s. 6d. **Benzol, 90 per cent.**, 10d.; 50-90 per cent., 8d. **Toluol**, 7½d. **Crude naphtha**, 3d.; **solvent naphtha**, 8½d.; **heavy naphtha**, 10d. **Creosote, London**, 1⅝d.; North, 1¼d. Heavy oils, 2d. to 2¼d. **Carbolic acid, 60 per cent.**, 1s. 11d. Refined naphthalene, £4 to £8; salts, 17s. 6d. to 20s. **Anthracene**, "A" quality, 1⅝d; "B" quality, unsaleable.

Sulphate of Ammonia.

There has been an absence of business during the past week; and prices remain practically unchanged. The Gaslight and Coke Company still ask £13 10s., and report having declined business at a trifle under this figure. The South Metropolitan Company have not altered their price, and are still quoting £13 15s. on their own special terms, at which figure, however, no business has resulted. In Leith, the demand for prompt delivery appears to be fairly good, as in one instance £13 7s. 6d. is reported to have been paid. There has been no business of importance done in Hull during the past week. Makers still quote £13 6s. 3d., and in some instances ask £13 7s. 6d.; but buyers are not willing to pay more than £13 5s. for early delivery.

COAL TRADE REPORTS.

Lancashire Coal Trade.

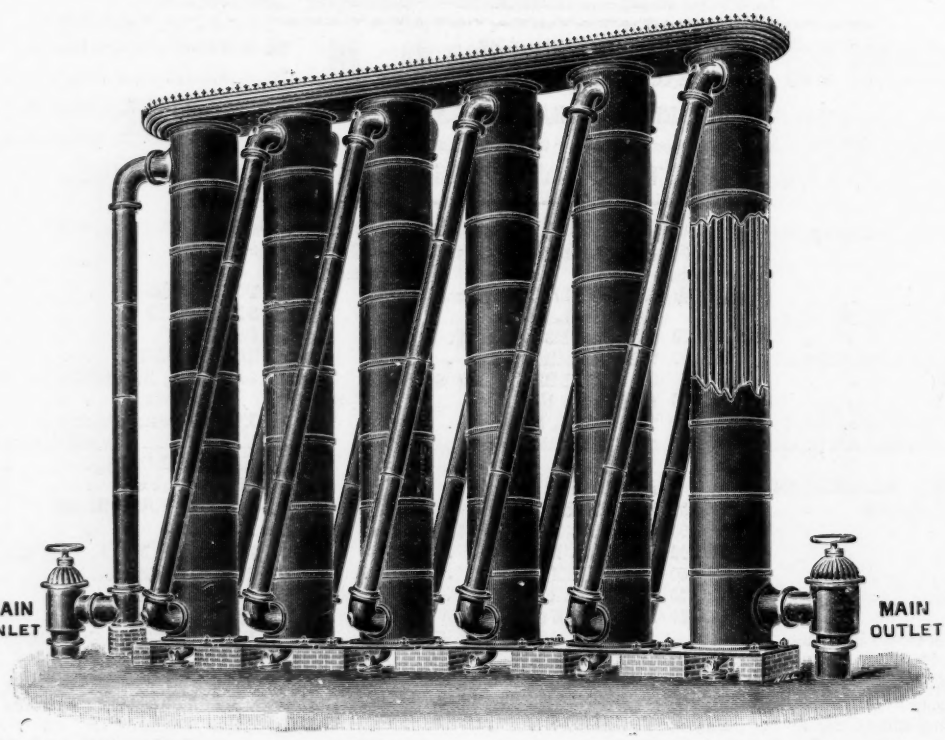
The increased price of steam coal of 5d. per ton has led some users to enter into fresh contracts without delay. The Westphalian strike, as we stated at the commencement, has not directly affected the Lancashire coalfields; but it has had the effect of strengthening prices generally, and no doubt proved a factor in bringing about the recent rise. The Belgian strike has come to a sudden termination, owing, it is said, to the lack of funds to maintain the strikers. This will not tend to shorten the difficulties in Westphalia so far as the coalowners are concerned, because the supply of coal from Belgium, which had been going to the disaffected Prussian state in large quantities, will now be continued. The rise in the charges for breeze, slack, and steam nuts, which has become general throughout Lancashire, is said to have been followed by a number of colliery owners in Derbyshire and Staffordshire. House coal continues in fair demand at late quotations; but there is no sign at present of any betterment in prices. Cannel continues to be sent out under contract in full supplies; and there is a little inquiry for furnace fuel. Best slack is fetching 7s. per ton at the pits, medium 6s. 6d., and common 5s. 3d. to 6s. Other sorts are unchanged. Coke is in more request—so much so that some collieries cannot meet the demand.

Northern Coal Trade.

There has been a continuance of the activity in the coal trade, and the heavy shipments of coal to the German and other Continental ports have made work brisk at the collieries. The demand for coal, however, has been more for that from the Northumbrian pits, and thus steam coals have been generally very firm in price. Best steams are nominally about 10s. per ton f.o.b., but the prices vary from day to day; second-class steams are 9s. 9d., unscreened steams are 8s. 6d., and steam smalls are firm and rather scarce at 6s. In the gas coal trade, a few cargoes for prompt delivery abroad have been sold at rather better prices; but no important contracts for this class

CONDENSERS.

WATER COOLING.



ATMOSPHERIC.

C. & W. WALKER, LTD.,

Midland Iron Works: DONNINGTON, SALOP.
London Office: 110, CANNON STREET, E.C.

of coal have been entered into of late, though one for Stockholm is in the market. There is more variation in the prices for occasional cargoes of gas coal; but 8s. to 9s. per ton f.o.b. represent much the general current quotations. The result of the tenders for other kinds of coal for Sweden, just announced, show that, for forward sales, prices are only slightly in advance. As to coke, the market is steady; but gas coke shows some advance in the stocks held by several companies, so that the prices are barely maintained, generally at about 13s. per ton f.o.b. for good gas coke.

Scotch Coal Trade.

Except that the export trade continues to improve, there is little to be said of the coal market. The home market is steady, with prices for main looking up; others are unchanged. The prices quoted are; Main 7s. 9d. to 8s. per ton f.o.b. Glasgow, ell 8s. 3d. to 9s. 3d., and splint 8s. 9d. to 9s. The shipments for the week amounted to 251,046 tons—a decrease of 12,278 tons upon the previous week, but an increase of 63,946 tons upon the corresponding week of last year. For the year to date, the total shipments have been 956,223 tons—an increase of 87,225 tons upon the same period of last year.

TRADE NOTES.

Milbourne's Patent Luteless Purifiers.

Further evidence has been afforded of the appreciation in which these purifiers are held by the fact that an order has been placed with Messrs. C. & W. Walker, Limited, of Donnington, Shropshire, by the Sutton Gas Company, for the supply and erection complete of a set of four, 25 feet square, arranged in line, and worked with Milbourne's patent system of valves and connections. Each purifier will be provided with two steel covers, fitted with his patent automatic rapid fasteners, which enable the covers to be fastened or released on all four sides at one operation. The whole of the work will be carried out under the supervision of Mr. George Mead-Robins, the Engineer and Secretary to the Company.

Meldrum's Refuse Destructor Plant.

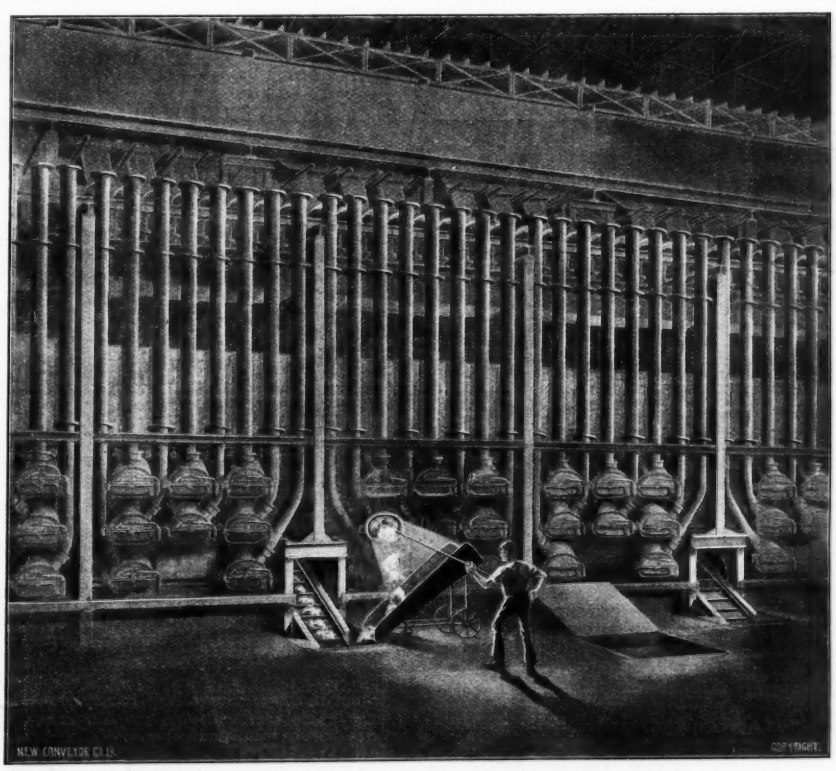
The Dublin Town Council have lately adopted the recommendation of the Special Committee appointed to report on the various tenders submitted for a large extension of their refuse destructor plant, and have unanimously accepted the tender of Messrs. Meldrum Bros., Limited, of Timperley. The Corporation of East Ham have also accepted the firm's tender for the erection of six of their patent "Simplex" regenerator cells at their sewage works. A tender of the firm for the erection of a refuse destructor to work in conjunction with the electric light station of the Middleton Corporation has just been accepted by the Town Council, on the recommendation of the Health and Electricity Committees. The contract will include the construction of a bridge across the river, and a "Simplex" regenerative destructor. It may be mentioned that the firm have put up plant at Preston which is now working all the electric traction in the town. In referring to the installation at a recent meeting of the Town Council, the Chairman of the Scavenging Committee (Mr. G. Dewhurst) said the Corporation possessed "one of the most up-to-date and efficient destructors in the world."

General Gas Lighting and Heating Company of France.—The operations of this Company for the past financial year, as revealed in the report presented at the recent annual meeting of shareholders in Paris, resulted in profits which allowed of the payment of a dividend of 45 frs. per share of 500 frs., being at the rate of 9 per cent. The Company own works and hold shares in those of other Companies. With regard to the former, there was an increase of about 70½ million cubic feet in the quantity of gas consumed. The position at the close of the year was as follows: Number of consumers, 27,267; street-lamps, 15,885; private lights, 277,899; gas-stoves, 22,150; gas-engines equal to 6010 horse power. The profits realized by the works amounted to 2,286,331 frs. (£91,453); and the interest arising on the shares in other undertakings came to 308,570 frs. (£12,343). After making various payments out of these sums, including an interim dividend of 25 frs. per share, there was left a balance of 550,788 frs. (£22,032). A sum of 64,950 frs. was allocated among the Directors; and the final dividend took 467,100 frs.—making, together, 532,050 frs. (£21,282½, and leaving 18,738 frs. (£750) to be carried forward.

Gas v. Electricity for Street Lighting in Belfast.—The Belfast Police Committee have recently had under discussion a proposal of the Electricity Committee that arc lamps should be substituted for incandescent gas in a few of the central thoroughfares; and some idea of what the change (if agreed to) would mean to the ratepayers can be gathered from a letter which one of the citizens has sent to a local paper. The correspondent referred to points out that the Committee propose to erect 125 arc lamps at a cost of £16 15s. each, amounting to £2093 15s. per annum. These would displace 308 gas-lamps, which cost £731 per annum, leaving a balance in favour of gas of £1362 5s. a year. The number of streets (or portions of streets) dealt with is eighteen, and the length a little under 3 miles. The cost per mile for electricity is thus £739 16s. 10d., and for gas £258 9s. 7d. If electricity is adopted, 308 gas-lamps would have to be removed, at a cost of £139 16s.; the original cost of the posts being £740 17s., and of the lanterns £1336 16s. 6d.—making a total of over £2217, which would be practically a dead loss to the city, as the large columns and heads could not now be used, owing to the fact that no lamps like these are being erected at present, or are likely to be erected elsewhere in the city. In a further letter, the correspondent points out that the cost of street lighting in Liverpool, where done by arc lamps, is £491 per mile, and the current is charged at 2d. per unit. In Belfast, the price asked is £739 16s. 10d. per mile; and yet it is said that the current is being reckoned at only 1d. per unit.

No Drawing Stage.

Perfect Regeneration.



Producer Fed with Hot Coke.

PATENT "DWARF" INCLINED RETORT-BENCH.

NEW CONVEYOR CO., LTD., SMETHWICK.

Extensions at Dublin.—Messrs. Clayton, Son, and Co., Limited, have been entrusted by the Alliance and Dublin Consumers' Gas Company with a contract for converting a two-lift telescopic gasholder, 180 feet in diameter, into a four-lift; also for the enlargement of the tank for it. The work will be carried out under the supervision of Mr. W. F. Cotton, the Gas Company's Engineer. When this holder is completed, it will be the largest in Ireland.

Carriage of Calcium Carbide on the Thames.—At the meeting of the Thames Conservancy on Monday last week, a letter was read from a City firm stating that a large quantity of carbide of calcium, manufactured in Norway, was exported to Austria *viâ* Hamburg, and that the trade could be secured for London if the Conservators would allow carbide to be shipped on vessels carrying explosives. A letter was also read from His Majesty's Chief Inspector of Explosives, which stated that he considered it would not be a stretching of bye-law 31 of the Explosives bye-laws to read it as including calcium carbide; and as all vessels clearing from British ports were required to have the holds ventilated, the additional risk would be infinitesimal. He suggested that the Conservators should allow calcium carbide to be carried in the same ship as explosives. The Board decided not to raise any objection to this being done.

Sales of Stocks and Shares.—At the Mart, Tokenhouse Yard, E.C., last Wednesday, Messrs. Fox and Bousfield sold some £10 ordinary shares (additional capital) of the North Middlesex Gas Company at £14 each, and some 5 per cent. preference stock at 101. On the same occasion, £10 shares in the Woking Water and Gas Company fetched £10 5s. apiece. The Chippendale Gas Company, by their Act of last year, obtained power to raise £25,000 of additional capital, and the first issue—£3000—was recently offered for sale by Messrs. Tilley and Parry. It was put up in lots of £100 and £50; and the former fetched from £126 to £132 10s., and the latter £63 10s. and £64 each. The total amount realized was £3813 10s. Last Thursday, Mr. John Hunter sold, at the offices of the West Hartlepool Gas and Water Company, £10,000 of the Company's ordinary stock, in £100 lots, at prices ranging from £124 to £125 2s. 6d. per lot.

Corporations and Plumbing Work.—At a recent meeting of the Todmorden Corporation, Mr. S. Jackson asked the meaning of the regulation that "no plumber or other workman will be allowed to do or perform any work connected with the supply of water until he shall have been admitted, enrolled, and published by the Water-Works Committee as an 'authorized water-works plumber.'" Did this apply only to master plumbers, or to workmen also? He thought it would create a difficulty if it applied to all plumbers. Alderman Dugdale asked whether the proposed regulations had been submitted to any of the master plumbers in the town, and whether their opinion had been obtained. He had questioned them as to the regulations, and generally they seemed to object to them. Alderman Lord remarked that, in drafting the regulations, the Committee had been guided by the advice and experience of some of the larger corporations.

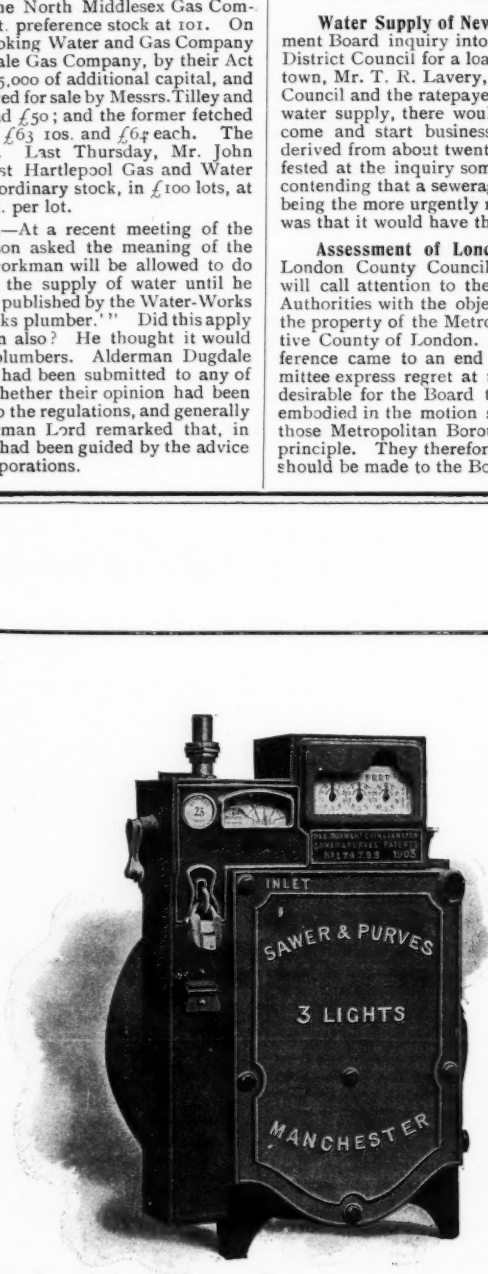
Birmingham and Compensation Water to the Wye.—Last month, a Committee of the Hereford County Council was appointed to consider the propriety of opposing in Parliament the proposal of the Birmingham Corporation to reduce the amount of daily compensation water to be discharged into the River Wye from 27 to 20 million gallons; and a petition in opposition was prepared by the Committee. The necessity for further action in the matter has, however, been obviated by the receipt by the Council of an intimation from the Town Clerk of Birmingham that the Corporation, in consequence of a request from the Wye Board of Conservators for its withdrawal, have decided not to proceed with this portion of the Bill.

Carrying Electric Wires across Roadways without Permission.—A novel excuse has been urged by the Electric Lighting Company at Tredegar for carrying electric wires across a public road without leave being granted them to do so. At a recent meeting of the Town Improvements Committee, the Surveyor (Mr. W. L. Roach) reported that the Tredegar Company had erected electric wires across the Council's roadway, although permission had been refused. A letter was read from Mr. L. D. Whitehead, on behalf of the Company, intimating that they could not abide by the decision of the Council not to grant permission, on the ground that the gas supplied by the Council was not up to the standard of quality required by the Act. The Clerk was instructed to obtain Counsel's advice before proceeding further.

Water Supply of Newtownards.—In the course of a Local Government Board inquiry into an application by the Newtownards Urban District Council for a loan of £17,500 to provide a water supply for the town, Mr. T. R. Lavery, the Chairman, stated that the majority of the Council and the ratepayers were satisfied that, until they had a proper water supply, there would be no inducements for manufacturers to come and start business there. The water at present available is derived from about twenty public wells in the town. There was manifested at the inquiry some opposition to the proposals; the objectors contending that a sewerage scheme should be taken in hand first, as being the more urgently required. Another argument against the loan was that it would have the effect of raising the rates to a high figure.

Assessment of London Water-Works.—At the meeting of the London County Council to-day, the Local Government Committee will call attention to the result of the conference of London Rating Authorities with the object of adopting a uniform method of valuing the property of the Metropolitan Water Board within the Administrative County of London. As already recorded (*ante*, p. 307), the conference came to an end without passing any resolution. The Committee express regret at this, and state their opinion that it would be desirable for the Board to proceed in accordance with the principle embodied in the motion submitted to the conference in dealing with those Metropolitan Borough Councils who are willing to adopt the principle. They therefore recommend that a suggestion to this effect should be made to the Board.

S&P



MANCHESTER
M&N
NOTTINGHAM

Power-Gas Plants.—The Tranmere Bay Development Company have placed a contract for a gas-driven electric installation for their shipyard now under construction on the Tranmere foreshore. The installation is to consist of a gas plant of 6000-horse power capacity, the larger portion of the gas generated being intended for firing furnaces. Messrs. R. Cundall and Sons, Limited, of Shipley, have devised a new form of suction gas plant, several installations of which have been put up in various places. The firm are now erecting one of 175-horse power for their works, which it is stated will effect a saving of £1000 per annum.

Gas-Stoves and Rubber Tubing.—At the London Coroner's Court, a few days ago, an inquiry was held into the cause of a fire which had occurred on the premises of Messrs. J. F. Farwig and Co., of Upper Thames Street, E.C. It appeared that one of the men employed on the premises had fitted up a small gas-stove for the purpose of warming his meals, and had connected it with the gas piping by means of a rubber tube. The wind had caused the stove to light-back, blowing the flame on to the rubber tube, which became ignited, and in its turn set fire to the woodwork of the bench. The Jury found that the fire was caused by a gas-stove not being properly turned off.

Burley-in-Wharfedale and the Otley Gas Question.—At the monthly meeting of the Burley-in-Wharfedale Rural District Council, Mr. Town (the Chairman of the Gas Committee) said that in the recent negotiations between the Otley District Council and the Gas Company, and at the public meetings held in connection therewith, some misleading statements had been made. At one of the meetings, Mr. Greaves, the Chairman of the Otley Council, had stated that a price had been arranged with the Burley Gas Committee at which they would continue to take gas from the Otley Council; but in reality no price had been named. The sole undertaking given by the Burley Committee was that if they continued to take gas from Otley, it would only be at a substantial reduction on the present charge.

Reductions in Price.—The Sleaford Gas Company have decided to reduce the price of gas from 3s. 4d. to 3s. 2d. per 1000 cubic feet. As reported in another part of the "JOURNAL," the Lincoln City Council have resolved to allow a discount of 7½ per cent. to consumers of over 6 million cubic feet per annum; and the Bristol Gas Company have reduced their price 2d. per 1000 cubic feet as from Christmas last. The Chester Gas Company also announce a further reduction of 2d. per 1000 cubic feet, subject to discounts as before. The Dukinfield Town Council have reduced by 2d. per 1000 cubic feet the price charged for gas supplied through prepayment meters; and the Stafford Town Council have decided, as from the close of the current quarter, to reduce the price of gas to be used for power purposes from 2s. 6d. to 2s. 4d. per 1000 cubic feet.

Cost of Electric Street Lighting at Gravesend.—A correspondent, who signs himself "Man in the Street," writes to one of the Gravesend papers pointing out the enormous increase that has taken place in the public lighting account since the Corporation started displacing the gas-lamps by electric lights. In 1904, the outlay was £2285, only £286 of which was for electricity. Last year, however, the expenditure was £2893, of which £1064 was for electricity. There was thus an increase of over £600 in the twelve months; and yet less than one-fourth of the gas-lamps have been cleared away to make business for the Corporation's own undertaking. It is therefore, says the writer, a very simple mathematical calculation as to what is in store for the suffering ratepayer when the whole of the gas-lamps are swept from the streets. "Is there," he asks, "any gentleman in the Council who can honestly say the town is the better lighted for the increesed expenditure?" And in spite of the assistance it has received in this respect, the undertaking is still being carried on at a loss.

The Cost of Fog.—The City Engineer of Westminster (Mr. J. W. Bradley, M.Inst.C.E.) recently gave a lecture at the Caxton Hall on the cause of fog and the different methods of dealing with it. A description was given of the system adopted by the Westminster City Council of lighting central spaces in time of fog by means of portable compressed air oil-lamps, and of their experiments with orange-tinted globes and special carbons in the electric arc lamps for the purpose of gaining a greater penetrative effect through the fog. The satisfaction of the Chief Commissioner of Police at the results was referred to; and Mr. Bradley stated that by no other Municipality, either on the Continent or in England, had any attempt been made to cope with the fog difficulties by the provision of special appliances. He further stated that, apart from all questions of the indirect loss caused through fog, the cost of extra lighting in dwelling-houses, shops, and offices, and the loss of efficiency in the work of men engaged in outdoor operations, during one day's fog, could not be less than £20,000 in Westminster alone. There was also a direct loss to the Council of some £200 a day in additional lighting.

Extensions at the Marple Gas-Works.—At the last monthly meeting of the Marple Urban District Council, it was reported that a Sub-Committee, in company with the Gas Manager (Mr. J. R. Mackenzie), had made a full inspection of the works, and had estimated at £2000 the cost of rebuilding and modernizing them, and providing for being able to supply the increased consumption which might be required for the next few years. The Chairman (Mr. F. Barlow) pointed out that it was necessary to expend a considerable sum in order to make the works and plant up-to-date. As they stood, the buildings were in a dangerous, or to say the least, an unsafe condition. The Council would agree with him that it would be unwise simply to alter the works to make provision for the next two years. The Local Government Board would ask, when the Council applied for a loan, what provision they were making for the future. He did not think they should attempt to cut down the amount, but get as much out of it as they could; and if the increase in the consumption of gas went on as it had done—and they anticipated that as the district grew there would be a much larger consumption—they would want extra plant. Hence they were anxious to provide at least for what might be required the next ten years. In reply to questions, the Chairman said he thought a rate of 2d. in the pound might be required in order to repay the loan. It was decided to apply at once for the loan of £2000 to carry out the work.

Our
"Souvenir of Success"
Explains the Success of
"Cannon" Cookers and Fires.

WHY NOT YOUR COMPANY SHARE THE ADVANTAGES?

Copy of Souvenir Free by post on application.

CANNON IRON FOUNDRIES, LTD.,
Deepfields, Nr. Bilston, Staffordshire.

London Offices and Show-Rooms:
Bath House, 57-60, Holborn Viaduct, E.C.

Poll on the Otley Gas Purchase Scheme.—Last Saturday, in accordance with arrangements, a poll was taken of the ratepayers of Otley on two proposals. The first was that the gas-works should be purchased for £92,000; and the voting was as follows: For, 627: against, 680; majority against, 53. The second proposal was that powers should be obtained to enable the Council to extend the period of the water-works loan from 35 to 60 years; and on this point the voting was: For, 605; against, 475; majority for, 130. The poll was the heaviest ever taken at Otley; for out of 2000 ratepayers, some 1500 recorded their votes. The result was received with cheers and cries of derision.

Outbreak of Typhoid Fever at Lincoln.—An outbreak of typhoid fever, which is attributed to the water supply, has occurred at Lincoln; and there are now something like 600 patients under treatment. It is explained that the exceptional drought which prevailed in Lincolnshire during the last month caused a shortage in the usual supply of water; and the authorities therefore had no alternative but to draw on the River Witham, the water of which was contaminated by sewage. A boring is in hand which is intended to tap the water in the new red sandstone at a depth of about 2000 feet; but the contractors (Messrs. Chapman and Sons) had an accident—the boring tool having dropped at about 800 feet—and they are now constructing a well in order to recover it. This well is complete 12 feet in diameter, to a depth of 400 feet, and about 10 feet in diameter, to a depth of 750 feet. It is expected that the tool will be recovered in the course of about a month, after which the boring will be continued. The supply from this source cannot be obtained for several years; but when it is there will be no more risk of typhoid fever being caused by the water supply.

Messrs. Ashmore, Benson, Pease, and Co., Limited, have received an order for a new steel tank and gasholder to be erected at the Eastleigh works of the Southampton Gas Company.

The South Coast Gas-Fitting Company, Limited, has been registered with a capital of £5000, in £1 shares, to carry on the business of gas and electric fittings makers, and manufacturers of, and dealers in, gas engines, stoves, meters, &c.

"Our late Reservists' widows having all re-married before the amount of money appropriated to each was exhausted, the fund has a surplus of about £100." This is an item in the report of the Hon. Secretary to the Reservists' Fund in connection with the South Metropolitan Gas Company's Co-Partnership scheme.

Messrs. Clayton, Son, and Co., Limited, have been successful in obtaining a contract with the Falkirk Gas Commissioners for taking down a two-lift gasholder and tank, 135 feet in diameter, enlarging them, and re-erecting them at the new gas-works. The work will be carried out under the supervision of Mr. William M'Crae, the Engineer to the Commissioners.

By an announcement which appears in another part of the "JOURNAL," it will be seen that the Newcastle and Gateshead Gas Company are inviting tenders for an issue of £50,000 of ordinary stock, which, at the present price of gas, will be entitled to a dividend at the rate of £4 12s. 6d. per cent. per annum. The minimum price is £105 per £100 of stock; and the tenders are to be sent in by the morning of the 27th inst.

Messrs. Graham, Morton, and Co., Limited, are issuing a booklet similar in get-up to the one describing their coal-screening plant at the Thrybergh Colliery at Kilnhurst, near Rotherham, recently noticed in our columns. The present pamphlet deals with the firm's system of cableways, aërial ropeways, cantilever cranes, electric telpherage, &c. In its preparation, technical features have been purposely avoided; the intention being to show by illustrations how many special conditions have been satisfied.

According to statements which have appeared in Provincial papers, the Gas Tube Association, representing manufacturers in London, the Midlands, and the North of England, has practically collapsed so far as the regulation of prices is concerned. At a recent meeting of representatives in Birmingham, it was decided to withdraw the list which has hitherto regulated prices on a basis of 75 per cent. discount. Although this scarcely covers the actual cost of production, some manufacturers were underselling, and the members are now free to meet outside competition.

WANTED, FOR SALE, CONTRACT, &c., ADVERTISEMENTS IN THIS WEEK'S "JOURNAL."

Situations Vacant.

SECRETARY AND MANAGER. Chippenham Gas-Works.
GAS MANAGER. Ebbw Vale Company. Applications by Feb. 25.
INSPECTOR OF PUBLIC LIGHTING. Pontifex and Co., London.
REPRESENTATIVE (GAS STOVES, &c.). Carron Company.
WORKS FOREMAN. Birmingham Gas Department.
CARBONIZING FOREMAN. Coventry Gas-Works.
FOREMAN. No. 4341.
FITTER IMPROVER. Alcester Gas-Works.

Situations Wanted.

CARBURETTED WATER GAS MAKER. No. 4340.
GAS ENGINEER. No. 4329.
METER INSPECTOR. No. 4330.
REPRESENTATIVE OF MANUFACTURING FIRM. No. 4342.
SHOW-ROOM MANAGER. No. 4339.

Agency Wanted by Engine Builders. No. 4335.

Plant Wanted (Second-Hand).

SCRUBBER (or WASHER SCRUBBER) AND CONDENSER. North Ormesby Gas Company. Offers by March 6.

Plant, &c., for Sale.

CAST IRON PLATES FOR SCRUBBERS. No. 4338.
EXHAUSTER, SCRUBBER, GASHOLDER, &c. Lichfield Gas Company.

Company Meetings.

BARNET GAS AND WATER COMPANY. Albion Tavern. Feb. 24. 12.30 o'clock.
BRIGHTON AND HOVE GAS COMPANY. London Offices. March 3. Two o'clock.
BROMLEY GAS COMPANY. Bromley. Feb. 21. Six o'clock.
WEST HAM GAS COMPANY. Liverpool Street Hotel. Feb. 28. 12 30 o'clock.

Loans on Mortgage.

Derwent Valley Water Board.

Stocks and Shares.

GRAYS GAS COMPANY. Feb. 21.
HARROW AND STANMORE GAS COMPANY. Feb. 21.
NEWCASTLE AND GATESHEAD GAS COMPANY. Feb. 27.
NORTH MIDDLESEX GAS COMPANY. Feb. 21.
SOUTHEND GAS COMPANY. March 7.
SUNDERLAND AND SOUTH SHIELDS WATER COMPANY. Feb. 15.

TENDERS FOR

Coal and Cannel.

WOODBRIDGE GASLIGHT AND COKE COMPANY. Tenders by Feb. 21.

Cookers.

BARROW-IN-FURNESS GAS DEPARTMENT. Tenders by Feb. 21.

Fire-Clay Goods (*see also* Retort Benches).

BARROW-IN-FURNESS GAS DEPARTMENT. Tenders by Feb. 21.
TYLDESLEY-WITH-SHAKERLEY GAS DEPARTMENT. Tenders by March 2.

General Stores, Oils, Paints, Iron, Ironmongery, Cement, &c.

BARROW-IN-FURNESS GAS DEPARTMENT. Tenders by Feb. 21.
BRIGHOUSE GAS DEPARTMENT. Tenders by Feb. 28.

Incandescent Mantles.

ROTHERHAM GAS DEPARTMENT. Tenders by Feb. 24.

Lime.

BARROW-IN-FURNESS GAS DEPARTMENT. Tenders by Feb. 21.

Meters.

BARROW-IN-FURNESS GAS DEPARTMENT. Tenders by Feb. 21.

Pipes (Wrought and Cast), &c.

BARROW-IN-FURNESS GAS DEPARTMENT. Tenders by Feb. 21.
BRIGHOUSE GAS DEPARTMENT. Tenders by Feb. 28.

Purifier.

ASHFORD GAS DEPARTMENT. Tenders by Feb. 23.

Retort Benches, &c.

NORTH ORMESBY GAS COMPANY. Tenders by March 6.
PORTADOWN GASLIGHT COMPANY. Tenders by March 1.
SOWERBY BRIDGE GAS DEPARTMENT. Tenders by Feb. 20.

Retort House.

NORTH ORMESBY GAS COMPANY. Tenders by March 6.

Scrubber (or Washer-Scrubber).

NORTH ORMESBY GAS COMPANY. Tenders by March 6.

Sulphuric Acid.

BARROW-IN-FURNESS GAS DEPARTMENT. Tenders by Feb. 21.

Tar.

BARROW-IN-FURNESS GAS DEPARTMENT. Tenders by Feb. 21.

OXIDE OF IRON.

O'NEILL'S OXIDE has a larger annual sale than all other Oxides combined.

SPENT OXIDE purchased in any district.

GAS PURIFICATION & CHEMICAL CO., LD.
JOHN WM. O'NEILL, Managing Director,
PALMERSTON HOUSE, LONDON, E.C.

WINKELMANN'S
"VOLCANIC" FIRE CEMENT.
Resists 4500° Fahr. Best for GAS-WORKS.
ANDREW STEPHENSON, 182, Palmerston House, Old Broad Street, London, E.C. "Volcanism, London."

SULPHURIC ACID for Sale, specially suitable for making Sulphate of Ammonia.
BROTHERTON AND CO, LTD., Chemical Manufacturers. Works: BIRMINGHAM, LEEDS, and WAKEFIELD,

J. & J. BRADDOCK (Branch of Meters Limited), Globe Meter Works, OLDHAM, and 45 & 47, Westminster Bridge Road, LONDON, S.E.
WET AND DRY GAS-METERS, PREPAYMENT METERS, STATION METERS, AND GOVERNORS.
REPAIRS RECEIVE PROMPT ATTENTION.
Telephones: 254 Oldham, and 2412 HOP, LONDON.
Telegrams:—
"BRADDOCK, OLDHAM," and "METRIQUE, LONDON."

DUTCH OXIDE OF IRON.

THE First Dutch Bog Ore Co., Ltd. (Eerste Hollandsche Yzererts Maaty), ROTTERDAM.
General Manager (for England and Wales)—
CHARLES E. FRY, LEAMINGTON; and at Tower Chambers, Brown Street, MANCHESTER.
London Managers—
E. PADFIELD & CO., 96-98, Leadenhall Street, LONDON, E.C.
General Manager (for Scotland)—
J. B. MACDERMOTT, 11, Bothwell St., GLASGOW.

OXIDE OF IRON.
(NATURAL.)
BALE & CHURCH will be pleased to send Quotations and Samples on application.
SPENT OXIDE PURCHASED.
BALE'S FIRE CEMENT for all Retort and Furnace work.
PAINT for Gasholders, Purifiers, &c.
5, CROOKED LANE, LONDON, E.C.

SULPHURIC ACID.

SPECIALLY prepared for the Manufacture of SULPHATE OF AMMONIA.
SPENCER, CHAPMAN, AND MESSEL, LIMITED, 36, Mark Lane, LONDON, E.C. Works: SILVERTOWN.
Telegrams: "HYDROCHLORIC, LONDON."
Telephone: 341, AVENUE.

GAS LIQUOR WANTED.
Particulars to MAJOR AND COMPANY, LIMITED, HULL.

NOTICES TO CORRESPONDENTS, ADVERTISERS, AND SUBSCRIBERS.

No notice can be taken of anonymous communications. Whatever is intended for insertion in the "JOURNAL" must be authenticated by the name and address of the writer; not necessarily for publication, but as a proof of good faith.

COPY FOR ADVERTISEMENTS for the "JOURNAL" should be received at the Office NOT LATER than TWELVE O'CLOCK NOON ON MONDAY, to ensure insertion in the following day's issue.

Orders for Alterations in, or stoppages of, PERMANENT ADVERTISEMENTS should be received by the FIRST POST on SATURDAY.

Wanted, For Sale, and Tender Advertisements, Six Lines and under, 3s.; each additional Line, 6d.

TERMS OF SUBSCRIPTION to the "JOURNAL."

United Kingdom: One Year, 21s.; Half Year, 10s. 6d.; Quarter, 6s. 6d.
Payable in Advance. If credit is taken, the charge is 25s. a year.

Abroad (in the Postal Union): £1 7s. 6d., payable in Advance.

All Communications, Remittances, &c., to be addressed to
WALTER KING, 11, BOLT COURT, FLEET STREET, LONDON, E.C.
Telegrams: "GASKING, LONDON." Telephone: P.O. 1571a Central.

ROBERT DEMPSTER & SONS, Ltd.,
Contractor for Complete CARBONIZING PLANTS and every description of GAS APPARATUS and ELEVATING and CONVEYING PLANT, ROSE MOUNT IRON-WORKS, ELLAND.

GAS TAR wanted.
BROTHERTON AND CO., LTD., Tar Distillers. Works: BIRMINGHAM, GLASGOW, LEEDS, LIVERPOOL, AND WAKEFIELD.

THE KEITH LIGHT.
OVER 1600 INSTALLATIONS IN DAILY USE.
SEE illustrated advertisement in next week's issue.
JAMES KEITH AND BLACKMAN CO., LTD., 27, Farringdon Avenue, LONDON, E.C.

COAL GAS TAR wanted.
BEST PRICES GIVEN.
SHARPNESS CHEMICAL COMPANY, LIMITED, Sharpness Docks, GLOS.

PATENTS AND TRADE MARKS
PUBLICATIONS, "MERCHANDISE MARKS ACT, and Decisions thereunder," 1s.; "TRADE SECRETS v. PATENTS," 6d.; "DOCTRINE of EQUIVALENTS, Mechanical and Chemical," 6d.; SUBJECT-MATTER of PATENTS," 6d.
MEWBURN, ELLIS, & PRYOR, Chartered Patent Agents, 70 and 72, Chancery Lane, London, W.C. Telegrams: "Patent London." Telephone: No. 243 Holborn.

AMMONIACAL Liquor wanted.
BROTHERTON AND CO., LTD., Ammonia Distillers. Works: BIRMINGHAM, GLASGOW, LEEDS, LIVERPOOL, AND WAKEFIELD.

"NUGEPE" CEMENT.
JOHN E. WILLIAMS AND CO.,
VICTORIA PAINT WORKS,
MANCHESTER.
For all Joints in connection with Oil-Gas Plant and Sulphate Plant.
For all Gas Joints.
For all Tar Joints.
For all Ammonia Joints.

SULPHATE OF AMMONIA
SATURATORS and all LEAD and TIMBER WORK in Connection with Sulphate Plants.
We guarantee promptness, with efficiency for Repairs.
JOSEPH TAYLOR AND CO., CENTRAL PLUMBING WORKS, BOLTON.
Telegrams: SATURATORS, BOLTON. Telephone 0848.

HYDRATED OXIDE OF IRON.
PREPARED from Pure Iron.
Twice as Rich as Bog Ore.
Gives no Back Pressure.
The Cheapest in the Market.
Can be Exchanged for Spent Oxide.
READ HOLLIDAY AND SONS, LTD., HUDDERSFIELD.

GASHOLDER PAINTING.
PAINTING Work for all kinds of Gas-Works Plant undertaken by contract or otherwise.
FREDERICK BOYALL, 31, Regent's Row, Queen's Road, DALSTON, N.E. Established 1850.

SPENT OXIDE.
THE South Metropolitan Gas Company are always open to receive OFFERS of SPENT OXIDE.
Chief Office: 709, Old Kent Road, London, S.E.
Telegrams: "METROGAS, LONDON."

BIGGS, WALL, & CO., 13, Cross Street,
Finsbury, E.C. *Telegrams:* "RAGOUT," LONDON. *Telephone:* 273 CENTRAL.
SULPHATE PLANT—See Advt. in last week's issue.
CHARGING MACHINES—See Advt. in this week's issue.
EXHAUSTING MACHINERY—See Advt. in next week's issue.

GLASS SHADES of every description,
for all kinds of Interior **GAS LIGHTING.**
Illustrated sheets on application.
JOHN WALSH WALSH,
SOHO AND VESTA GLASS WORKS, BIRMINGHAM.
Telegrams: "VESTA, BIRMINGHAM."
National Telephone: No. 63.
London Show-Room: 4, HOLBORN CIRCUS, E.C.

OXIDE OF IRON.
WESTBURY OXIDE is now being ex-tensively used for Gas Purification.
For Price and Analysis write to the NEW WESTBURY IRON COMPANY, LIMITED, WESTBURY, WILTS.

BROTHERTON & CO., LIMITED.
Offices: Commercial Buildings, LEEDS.
Correspondence invited.

GAS and Water Works Supplies and Construction Company, Limited, are open to purchase small or large Gas-Works. Constructors for all Gas and Water Work and Main Laying. All Gas and Water Works Plant and Fittings supplied. Gas and Water Works Financed. Shares and Stock accepted in part payment for Work and Materials supplied. Gas and Water Works Shares and Stock Underwritten and Issued.
LONDON OFFICE, 99, CANNON STREET, E.C.

GAS TAR and AMMONIACAL LIQUOR wanted by
GEORGE MILLER AND CO., Tar Distillers,
40, West Nile Street, GLASGOW.

MESSRS. BLYDE, LEDINGHAM, & CO.,
The Wallace Steel Works, Sheffield, beg to announce that they have recently extended their works for the manufacture of their SPECIAL QUALITY CRUCIBLE STEEL CASTINGS, specially for Collieries, Engineers and Machine Makers, Tramways, Gas-Works, Railway Engineers, &c., and have now exceptional facilities for increasing their output of TOUGHENED STEEL CASTINGS. Steel Castings made by the Crucible process only, ranging from 1 lb. weight up to 1400 lbs. Special attention paid to the better qualities and thoroughly reliable Castings that are required for Machine Makers, Engineers, &c.
SPECIALITY: STEEL CASTINGS FOR STOKING and CHARGING and DRAWING MACHINERY for GAS-WORKS; also various Sorts of STOKING TOOLS, COKE BREAKERS, &c.
Send all inquiries to BLYDE, LEDINGHAM, AND CO., The Wallace Steel Works, SHEFFIELD.

WANTED, a situation as Carburetted WATER-GAS MAKER. Nine Years' Experience. Good References.
Address No. 4340, care of Mr. King, 11, Bolt Court, FLEET STREET, E.C.

YOUNG MAN, Managing Gas Show-Room, wishes to take similar position in another town. Has had a good all-round Experience in several up-to-date Gas Show-Rooms. Good address and References.
Address No. 4339, care of Mr. King, 11, Bolt Court, FLEET STREET, E.C.

GENTLEMAN, holding good official position in large Suburban Gas Company, desires to represent large Firm of Manufacturers doing business with leading Gas Companies in United Kingdom and Ireland, or British Isles.
Address, No. 4342, care of Mr. King, 11, Bolt Court, FLEET STREET, E.C.

GAS Engineer wishes to recommend Young Man as Meter Inspector, Collector, Timekeeper, &c. Thoroughly trustworthy. Abstainer.
Apply, by letter, to No. 4330, care of Mr. King, 11, Bolt Court, FLEET STREET, E.C.

CARBONIZING Foreman wanted.
Must understand Regenerative Firing and be capable of Controlling men. Eight Hour shifts. Wages 45s. per week.
Apply, by letter, to the MANAGER, Gas-Works, COVENTRY.

INSPECTOR of Public Lighting required for the Supervision of Street Lamps with extensive Experience. Salary £150 per annum.
Apply, by letter only, to S. PONTIFEX AND CO., Regnart Buildings, Euston Street, LONDON.

CARRON Company require a First-Class REPRESENTATIVE for Gas Cooking and Heating Appliances in Lancashire and Yorkshire District. Applicants must have held similar position.
Apply, by letter, stating full Particulars, to GENERAL MANAGER, Carron Works, Carron, STIRLINGSHIRE, N.B.

WANTED, at once, Young Man, about 19, as FITTER-IMPROVER. Gas-Works training. Used to Stoves, Meters, Gas-Fitting, and Main and Service Connecting. Willing to make himself useful on 7 Million feet works. Respectable and Total Abstainer.
Apply, with References or Testimonials, stating Wages required, to MANAGER, Gas-Works, ALCESTER.

GAS Engineer, with over 20 years' Practical Experience, is prepared to accept ENGAGEMENT as Engineer, Manager, or Secretary.
Apply, by letter, to No. 4329, care of Mr. King, 11, Bolt Court, FLEET STREET, E.C.

WANTED, a Gas Manager for the Ebbw Vale Company's Gas-Works. Capacity about 6 Million cubic feet per month.
Apply, stating Age, Experience, and Salary required, to the GENERAL MANAGER, Ebbw Vale Steel, Iron, and Coal Company, Limited, Ebbw Vale, MON.

ENGINE Builders in the North would be glad to take AGENCY for selling any kind of Machinery to be driven by such Engines, chiefly Large and Medium sizes. A good all-round old established connection, particularly in Scotland and the North of England.
Address No. 4335, care of Mr. King, 11, Bolt Court, FLEET STREET, E.C.

CHIPPENHAM GAS COMPANY.
A SECRETARY and Manager is re-quired for the Gas-Works at Chippenham.
Candidates must be fully qualified to undertake the Entire Management of the Works and the various duties pertaining to the Office of Secretary.
Applications, stating Age, Salary required, and giving full Particulars of Qualifications, and accompanied by *copies* of not more than Three Testimonials, to be addressed to Mr. D. Collen, Chairman of the Company, on or before Friday, Feb. 24, 1905.
Canvassing will be deemed a disqualification.

GAS-WORKS FOREMAN.
WANTED, in the Lancashire District, for a Works making about 200 Millions, a smart reliable GENERAL FOREMAN. Must be capable of managing Workmen, thoroughly steady, and up-to-date, with a thorough knowledge of Regenerative Furnaces and Settings, Boilers, Engines, and other Machinery. House, Coal, and Gas free.
Apply, stating Age, previous Experience (which must be of the same character), and Wages required, to No. 4341, care of Mr. King, 11, Bolt Court, FLEET STREET, E.C.

CITY OF BIRMINGHAM.
(GAS DEPARTMENT.)
REQUIRED, Two Works Foremen, Eight hour shifts—viz., 10 p.m. till 6 a.m, and 2 p.m. till 10 p.m., changing over fortnightly.
Applicants must have had a good Mechanical Training, be well acquainted with up-to-date Plant and Machinery, and used to controlling men. Commencing salary £130 per Annum.
References and all Particulars to be sent to the undersigned, City Gas-Works, Saltley, Birmingham, on or before Saturday, Feb. 25.
HENRY HACK,
Engineer-in-Chief.

PURIFIERS, &c., FOR SALE—Sets of 4 ft., 5 ft., 6 ft., 8 ft., 9 ft., 10 ft., 12 ft., 18 ft. squares; also 16 ft. by 12 ft., &c. SCRUBBERS, 8 ft. by 60 ft. 10 inch, 18 inch Square METERS. EXHAUSTERS up to 50,000 feet per hour in Stock. GASHOLDERS and TANKS, also New. State requirements.
FIRTH BLAKELEY AND CO., Thornhill, DEWSBURY.

GAS PLANT for Sale—I can always offer NEW and SECOND-HAND GAS APPARATUS, including Retorts and Fittings, Condensers, Exhausters, Scrubbers, Washers, Purifiers, Gasholders, Tanks, Valves, Connections, &c. Also a few COMPLETE WORKS. Compare Prices and Particulars before ordering elsewhere.
J. F. BLAKELEY, Gas Engineer, Thornhill, DEWSBURY.

FOR SALE.
THE Lichfield Gas Company will shortly have the following PLANT for disposal.
One Anderson's EXHAUSTER, belt driven by horizontal Steam-Engine, equal to 10,000 cubic feet per hour.
One Composite TOWER-SCRUBBER, 6 feet diameter by 20 feet high, board filling and 8-inch Connections.
One untrussed GASHOLDER, 44 feet diameter by 14 feet deep, four Columns, Girders, Chains, and Weights.
Purchasers to remove same from present site. No reasonable offer refused. May be seen at any time by arrangement with the MANAGER, Gas-Works, Lichfield, STAFFS.

NORTH ORMESBY GAS COMPANY, LIMITED.
WANTED, a Scrubber (or Washer-Scrubber) and CONDENSER for a make of a Quarter-of-a-Million Cubic Feet of Gas per day. New or second-hand.
Prices and Particulars to T. WEATHERLY, Secretary, on or before March 6, 1905.

NORTH ORMESBY GAS COMPANY, LIMITED.

RETORT-HOUSE ALTERATIONS.

TENDERS wanted for the Erection of Two additional RETORT BEDS on Regenerative System, with Ironwork complete; also extension of present RETORT-HOUSE.

Particulars to be had from T. WEATHERLY, Secretary.

Offers to be received on or before March 6, 1905.

NEW Gasholder, 40 ft. diameter by 12 ft. deep, with Steel Standards; also new STEEL TANK to contain same.

Write J. WRIGHT, 181, Queen Victoria Street, LONDON, E.C.

TESTING PLANT FOR SALE—We have several small Sets of GAS APPARATUS, including Retorts, Condensers, Scrubber, Purifiers, Gasholders, overhauled and guaranteed, or New throughout.

FIRTH BLAKELEY AND CO., Thornhill, DEWSBURY.

FOR SALE, in good condition, Cast-Iron Plates for Two Walker Tower Scrubbers, 5 ft. diameter by 38 ft. high, with planed joints. Replaced by larger plant.

Address No. 4338, care of Mr. King, 11, Bolt Court, FLEET STREET, E.C.

THE Directors of the Woodbridge Gas- light and Coke Company, Limited, invite TENDERS for the supply of about 1400 Tons of unscreened GAS COAL during the next Twelve Months. Quotations to be f.o.b. at some East Coast Port, or in waggons at Woodbridge Station, G.E.R.

Tenders to be sent in on or before Feb. 21, inst., addressed to Alfred Gall, Secretary, Woodbridge.

The lowest or any Tender not necessarily accepted.

TYLDESLEY-WITH-SHAKERLEY URBAN DISTRICT COUNCIL.

THE Gas Committee of the above Council invite TENDERS for FIRE-CLAY GOODS, including RETORS, BRICKS, BLOCKS, TILES, FIRE-CLAY, &c.

Full Particulars and Quantities, with Form of Tender, may be obtained on application to Mr. R. H. Ginman, Engineer, Gas-Works, Tyldesley.

Sealed, endorsed Tenders, on Official Forms only, to be sent to the undersigned not later than Thursday, March 2, 1905.

By order,
WM. J. MATTHEWS,
Clerk to the Council.

Council Offices, Tyldesley,
Manchester, Feb. 10, 1905.

BOROUGH OF BARROW-IN-FURNESS.

THE Corporation are prepared to re- ceive TENDERS for the purchase of the surplus GAS TAR and OIL-GAS TAR produced at their Gas-Works from the 1st day of April next to the 31st day of March, 1906, delivered into the Purchaser's Tank-Waggons and Barrels at the Gas-Works Siding.

Any further Information may be had on application to the Manager of the Gas-Works.

Sealed Tenders, addressed to the Chairman of the Gas and Water Committee, and endorsed "Tender for Tar," to be delivered at the Town Clerk's Office, on or before Tuesday, the 21st day of February, 1905.

The lowest or any Tender not necessarily accepted.

By order,
C. F. PRESTON,
Town Clerk.

Town Hall, Barrow-in-Furness.

BOROUGH OF BARROW-IN-FURNESS.

THE Corporation are prepared to re- ceive TENDERS for the supply of Machine-Moulded FIRE-CLAY RETORTS, FIRE-BRICKS, CAST-IRON PIPES, WROUGHT-IRON TUBES and FITTINGS, BRASS COCKS, GAS-METERS, GAS-COOKERS, OIL, LIME, IRONMONGERY, and SULPHURIC ACID as may be required from the 1st day of April next to the 31st day of March, 1906.

Sealed Tenders, on Forms to be obtained at the Office of the Manager of the Gas and Water-Works, addressed to the Chairman of the Gas and Water Committee, and endorsed "Tender for Stores," to be delivered at the Town Clerk's Office on or before Tuesday, the 21st of February, 1905.

The lowest or any Tender not necessarily accepted.

By order,
C. F. PRESTON,
Town Clerk.

Town Hall, Barrow-in-Furness.

SOWERBY BRIDGE URBAN DISTRICT COUNCIL.

TENDERS FOR RETORT-BENCH.

THE Gas Committee invite Tenders for the following Work to be done at their Luddenden Foot Gas-Works:—

Pulling down existing Retort-Bench in sections, and for the supply and erection on the Regenerator System of Six SETTINGS of Six RETORTS, with all Furnace Fittings, Retort Mountings, Foundations, Subways, &c., complete.

On receipt of £1 1s. (which will be returned for *bona-fide* Tenders), Specification and Forms of Tender and any other Information required can be obtained from the Engineer, Mr. A. W. Bissell, Gas-Works, Sowerby Bridge.

The Council do not bind themselves to accept the lowest or any Tender.

Sealed Tenders, endorsed "Retort-Bench," to be received by the undersigned not later than Twelve o'clock noon on Monday, Feb. 20, 1905.

R. W. EVANS,
Solicitor and Clerk to the Council.

Commercial Bank Chambers,
Halifax.

BOROUGH OF BRIGHOUSE.

THE Town Council are prepared to receive TENDERS for the supply of the following STORES—viz, IRONMONGERY, OIL, PAINTS, &c., WROUGHT-IRON TUBES and FITTINGS, and BRUSHES required by the Gas Committee during the Year ending March 31, 1906.

Specification and Form of Tender can be obtained on application at the Gas Engineer's Office, Mill Lane Works, Brighouse.

Sealed Tenders are to be sent in on or before Tuesday, the 28th day of February, 1905, addressed to the Town Clerk, Municipal Offices, Brighouse.

The lowest or any Tender not necessarily accepted.

By order,
JAMES PARKINSON,
Town Clerk.

Municipal Offices, Brighouse,
Feb. 6, 1 05.

COUNTY BOROUGH OF ROTHERHAM.

THE Gas Committee are prepared to receive TENDERS for the supply of INCANDESCENT MANTLES required for a period of Six Months.

Further Particulars may be obtained on application to the Gas Engineer.

Tenders, endorsed "Tender for Mantles," to be sent to me not later than the 24th inst.

By order,
W. J. BOARD,
Town Clerk.

Town Hall, Rotherham,
Feb. 7, 1905.

ASHFORD (KENT) URBAN DISTRICT COUNCIL.

THE Gas Committee of the above Council are prepared to receive TENDERS for a 20-feet square by 5 feet deep PURIFIER, with Valves, 12-inch Connections, and Lifting Gear complete, delivered and erected at their Works.

Particulars may be obtained from Mr. J. Morton, the Manager, at the Works, and Tenders, endorsed "Purifier, must be delivered at my Office, 11, Bank Street, Ashford, Kent, not later than 5 p.m. on Thursday, Feb. 23, 1905.

JOHN CREERY,
Clerk.

Feb. 9, 1905.

PORTADOWN GASLIGHT COMPANY, LIMITED.

NEW RETORT-BENCH.

THE Directors of the Portadown Gas- light Company, Limited, are prepared to receive TENDERS, Specifications, and Drawings, for a BENCH of RETORTS to consist of Three Ovens, with Eight Retorts in each Oven, with separate Hydraulic Main for each Oven, and all Ironwork complete. Erected Complete.

Tenders to be addressed to James Nisbet, Manager, Gas-Works, Portadown, Ireland, who will give any information required.

Tenders to be received not later than the 1st of March.

The Directors do not bind themselves to accept the lowest Tender.

Gas-Works, Portadown, Feb. 7, 1905.

BROMLEY GAS CONSUMERS' COMPANY.

NOTICE is Hereby Given, that the ORDINARY HALF-YEARLY GENERAL MEETING of this Company will be held at the "Bell" Hotel, Bromley, Kent, on Tuesday, the 21st day of February, 1905, at Six o'clock p.m. precisely, to receive the Report of the Directors, with the Balance-Sheet certified by the Auditors, to declare a Dividend, to elect Three Directors and an Auditor on retirements by rotation, and to transact generally the business of a General Meeting.

The TRANSFER BOOKS WILL BE CLOSED from the 4th of February, to the 21st of February, both days inclusive.

By order of the Board,
HENRY W. AMOS,
Secretary.

Offices: 156, High Street,
Bromley, Kent, Feb. 4, 1905.

WEST HAM GAS COMPANY.

NOTICE is Hereby Given, that the ORDINARY HALF-YEARLY MEETING of the Proprietors of this Company will be held at the Abercorn Rooms, Liverpool Street Hotel, E.C. (Bishopsgate Street entrance), on Tuesday, the 28th day of February, 1905, at 12.30 p.m. o'clock precisely, to receive the Report of the Directors and Statement of Accounts for the Half-Year ending the 31st of December, 1904, to declare Dividends, to elect Two Directors and an Auditor in the place of those retiring by rotation, and for other general business.

The TRANSFER BOOKS of the Company, so far as they relate to Consolidated Ordinary and Preference Stocks, WILL BE CLOSED from the 15th to the 28th of February, both days inclusive.

By order of the Board,
A. G. SNELGROVE,
Secretary.

Gas-Works, Stratford, E.,
Feb. 4, 1905.

THE Derwent Valley Water Board is prepared to receive a limited amount of money upon Mortgage at £3⅜ per cent. per annum either for a term of years, not exceeding seven, or repayable at six months' notice from either party.

The Derwent Valley Water Board was constituted by Parliament in 1899 to supply water to the towns of Derby, Leicester, Nottingham, and Sheffield, and the monies required for carrying out the necessary Works are, by the powers of the Derwent Valley Water Acts 1899 to 1904, secured upon the Revenues and Rates of the said Towns in due proportion.

Applications to be sent to Mr. W. Gill Hodgson, Accountant to the Board, Bamford, via Sheffield.

By order,
O. B. STEWARD,
Clerk to the Board.

BRIGHTON AND HOVE GENERAL GAS COMPANY.

TO THE PROPRIETORS.

NOTICE is Hereby Given, that the ORDINARY HALF-YEARLY GENERAL MEETING of the Proprietors of the Company will be held at the Company's Offices, No. 5, Great Winchester Street, Old Broad Street, London, on Friday, March 3, 1905, at Two o'clock in the afternoon precisely, to receive the Report of the Directors and the Accounts of the Company for the Half Year ended the 31st of December, 1904, to declare Dividends, to elect Directors, to appoint an Auditor, to appoint a special Auditor, and for other Purposes.

The TRANSFER BOOKS of the Company WILL BE CLOSED from the 18th of February to the 3rd of March, both days inclusive.

By order,
ERNEST L. BURTON,
Secretary.

5, Great Winchester Street,
Old Broad Street, London, E.C.
Feb. 14, 1905.

ISSUES BY AUCTION OF GAS AND WATER STOCKS AND SHARES.

MR. ALFRED RICHARDS begs to notify that his ISSUES by AUCTION under PARLIAMENTARY POWERS of STOCKS and SHARES in LONDON, SUBURBAN, and PROVINCIAL GAS and WATER COMPANIES take place PERIODICALLY at the Mart, TOKENHOUSE YARD, E.C.

Terms for Issuing such Capital, and also for including Gas and Water Stocks and Shares belonging to Private Owners in these Periodical Sales, can be obtained on application at MR. ALFRED RICHARDS' OFFICES, 18, FINSBURY CIRCUS, E.C.

By order of the Directors of the
GRAYS GAS COMPANY, LIMITED.

NEW ISSUE OF 400 £10 "B" SHARES.

MR. ALFRED RICHARDS will Sell the ABOVE BY AUCTION, at the Mart, E.C., on Tuesday, Feb. 21, at Two o'clock, in Lots.

Particulars of the AUCTIONEER, 18, FINSBURY CIRCUS, E.C.

By order of the Directors of the
HARROW AND STANMORE GAS COMPANY.

NEW ISSUE OF 500 £10 "C" SHARES.

MR. ALFRED RICHARDS will Sell the ABOVE BY AUCTION, at the Mart, E.C., on Tuesday, Feb. 21, at Two o'clock, in Lots.

Particulars of the AUCTIONEER, 18, FINSBURY CIRCUS, E.C.

By order of the Directors of the
NORTH MIDDLESEX GAS COMPANY.

NEW ISSUE OF 300 £10 ORDINARY SHARES, AND £2000 FOUR PER CENT. PERPETUAL DEBENTURE STOCK.

MR. ALFRED RICHARDS will Sell the ABOVE BY AUCTION, at the Mart, Tokenhouse Yard, E.C., on Tuesday, Feb. 21, at Two o'clock, in Lots.

Particulars of the AUCTIONEER, 18, FINSBURY CIRCUS, E.C.

By order of the Directors of the
SOUTHEND GAS COMPANY.

NEW ISSUE OF £20,000 NEW ORDINARY "B" STOCK, and £6500 FOUR PER CENT. PERPETUAL DEBENTURE STOCK.

MR. ALFRED RICHARDS will Sell the ABOVE BY AUCTION, at the Mart, E.C., on Tuesday, March 7, at Two o'clock, in Lots.

Particulars of the AUCTIONEER, 18, FINSBURY CIRCUS, E.C.

NEWCASTLE-UPON-TYNE AND GATESHEAD GAS COMPANY.

SALE OF £50,000 ORDINARY STOCK.

THE Directors offer for Sale by Tender £50,000 ORDINARY STOCK, to be issued under the provisions of the Newcastle-upon-Tyne and Gateshead Gas Act, 1901. Applications receivable up to Ten a.m. on the 27th of February, 1905.

When gas is charged at the present rate of 2s. per 1000 cubic feet, the Authorized Dividend is £4 12s. 6d. per cent.

Any amount of Stock, being not less than £5, or a multiple thereof, may be applied for. A deposit of 5 per cent. on the nominal amount of Stock applied for must accompany each Tender, and the balance be paid on or before the 29th of April, 1905. Interest at the rate of 4½ per cent. per annum will be allowed upon prepayments.

MINIMUM PRICE, £105 PER CENT.

The Company's profit for the year 1904 was £113,354; and after paying all interest and full statutory dividends, there was left a surplus profit of £21,530.

During the last Five Years, the number of consumers has increased by 32,695, and the gas sold by 438,954,000 cubic feet.

Prospectuses and Forms of Tender will be sent on application to the undersigned.

THOS. WADDOM,
Secretary.

Newcastle-upon-Tyne, Feb. 6, 1905.

SUNDERLAND AND SOUTH SHIELDS WATER COMPANY.

IMPORTANT SALE OF WATER STOCK.

TO BE SOLD by Auction, in the Long Room of the Queen's Hotel, Fawcett Street, Sunderland, on Wednesday, the 15th of February, 1905, at Two o'clock in the afternoon prompt.

MR. ATKINSON GIBSON, AUCTIONEER,

£15,000

(Nominal) of ADDITIONAL ORDINARY CAPITAL STOCK,

(Maximum Dividend 5 per cent.) authorized to be created and issued under the powers contained in the Sunderland and South Shields Water Act, 1891.

The above Stock will be entitled to Dividend from the 1st day of January, 1905, and be registered in the name of the Purchaser free of charge.

A deposit of 10 per cent. will be required at the time of Sale; the remainder to be paid on or before the 1st day of March, 1905.

JOHN HALL & CO.,
STOURBRIDGE,
Manufacturers of
FIRE-BRICKS, LUMPS, TILES,
GAS RETORTS,
And every description of Fire-Clay Goods.

RETORTS CAREFULLY PACKED FOR SHIPMENT.

THE
"ROTARY"
STATION METER.

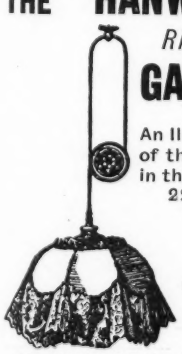
Efficiency Demonstrated.

APPLY—
T. G. MARSH,
MAWSON CHAMBERS, DEANSGATE,
MANCHESTER.

RAILS.
New and Second-Hand with all Accessories; also Tip Waggons and Turntables.

B. M. RENTON,
MIDLAND WORKS,
SHEFFIELD.

THE **"HANWELL"** PATENT
Rising and Falling
GAS PENDANT.



An Illustrated Description of this Pendant appeared in the "Journal" for Nov. 22, 1904 (page 599).

Write for full Particulars to the
"HANWELL" Pendant Company,
96, ABINGTON STREET, NORTHAMPTON.

SOMETHING NEW.

Mr. Micawber expected something good to turn up.

IT HAS.

"CYCLONE"

WRITE FOR PARTICULARS—
THE
IMPERIAL STOVE COMPANY,
LEAMINGTON.

THE PERFECT MANTLE CO^{Y}.
28, Minories, London, E.C.
Manufacturers of Incandescent Mantles.
Importers of all kinds of Fittings & Accessories.

TRY OUR WELL-KNOWN
SUPERIOR "PERMCO" MANTLES.

Illustrated Catalogue Free on Application.
Agents for the "WOLFF LIGHT" INVERTED LAMP.

JAMES OAKES & CO.,
ALFRETON IRON-WORKS, DERBYSHIRE,
AND
Wenlock Iron Wharf, 21 & 22, Wharf Road, CITY ROAD, LONDON, N.,
Manufacture and keep in Stock at their Works (also large stock in London)
PIPES and CONNECTIONS, 1½ to 48 inches in diameter, and make and erect to order RETORTS, PURIFIERS, and TANKS, with or without planed joints, COLUMNS, GIRDERS, SPECIAL CASTINGS, &c., required by Gas, Water, Railway, Telegraph, Chemical, Colliery, and other Companies.

NOTE.—Makers of HORSLEY'S PATENT SYPHONS. These are cast in one piece, without Chaplets; doing away with Bolts, Nuts, and Covers, and rendering Leakage impossible

THOMAS TURTON AND SONS, LIMITED,
SHEAF WORKS, SHEFFIELD,
MANUFACTURERS OF
FILES OF BEST QUALITY FOR ENGINEERS.
STEEL OF ALL DESCRIPTIONS.
SCREW STOCKS, TAPS AND DIES, SPANNERS, RATCHET BRACES, LIFTING JACKS, ANVILS, VICES, AND ENGINEERS' TOOLS GENERALLY,
LONDON OFFICE:
90, CANNON STREET, E.C.

TROTTER, HAINES, & CORBETT,
BRETTELL'S ESTATE LIMITED,
FIRE-CLAY & BRICK WORKS,
STOURBRIDGE.

Manufacturers of GAS-RETORTS, GLASSHOUSE FURNACE & BLAST-FURNACE BRICKS, LUMPS, TILES, and every description of FIRE-BRICKS.
Special Lumps, Tiles, and Bricks for Regenerative and Furnace Work.
SHIPMENTS PROMPTLY AND CAREFULLY EXECUTED.

LONDON OFFICE: R. CULL, 34, OLD BROAD STREET, E.C.

Typewriter means
Remington
all the world over
—Get the Idea!
100, Gracechurch Street, London, E.C.

Gas Companies are solicited to try Samples of the
MIRFIELD GAS COAL
UNEQUALLED.
Sperm Value 878·85 lbs. per Ton.

Prices and Analysis on application.
The MIRFIELD (GAS-COAL) COLLIERIES CO., RAVENSTHORPE, NEAR DEWSBURY.

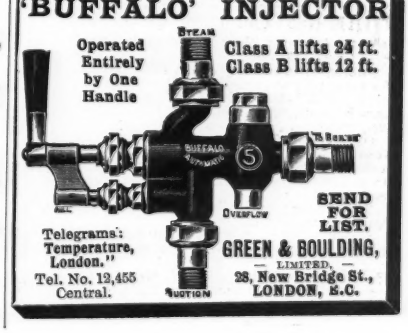
NEWBATTLE CANNEL.
Highest Results in Gas, & Excellent Coke.

QUOTATIONS ON APPLICATION TO
THE LOTHIAN COAL COMPANY,
LIMITED,
NEWBATTLE COLLIERIES,
DALKEITH, N.B.

HEATHCOTE GAS COAL.
Rich in Illuminating Power and yield of Gas.
Above the Average in Weight and Quality of Coke.
Maintains a High Standard in Residuals.

THE GRASSMOOR CO., LD.,
CHESTERFIELD.

'BUFFALO' INJECTOR



ALEXANDER CAMERON,
GAS AND CANNEL COAL MERCHANT,
48, WEST REGENT STREET,
GLASGOW.

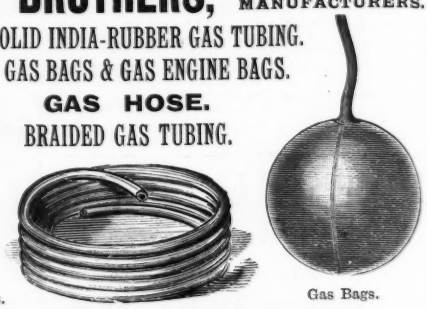
Now Ready. Price 5s. 6d. Post Free.
REPORTS OF DISTRICT GAS ASSOCIATIONS FOR 1904.
LONDON:
WALTER KING, 11, Bolt Court, FLEET STREET, E.C.

THOMAS DUXBURY & CO.,
16, DEANSGATE, MANCHESTER.
Best Gas Coal and Cannel, giving High Illuminating Power, Large Yield per ton, and reasonable in Price.
Telegrams: "DARWINIAN, MANCHESTER."
Telephone 1806.

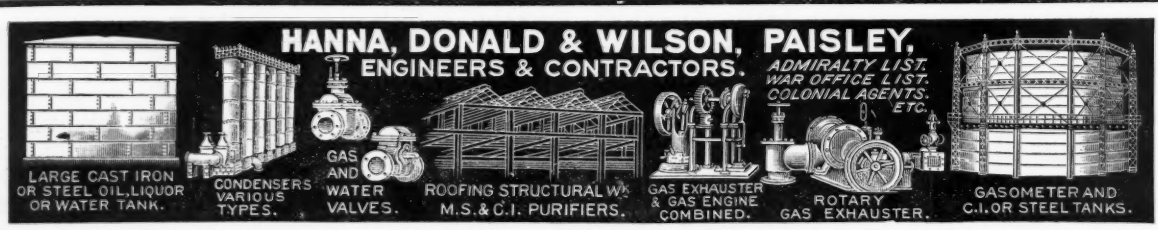
Price 10s. 6d. Green Cloth, Gilt Lettered.
VOL. LXXXVIII.,
OF THE
JOURNAL OF GAS LIGHTING,
WATER SUPPLY, &c.
LONDON: WALTER KING, 11, Bolt Court, Fleet Street, E.C.

Demy 4to. Limp Cloth. Price 7s. 6d. (Post free).
The Flow of Gases & Proportioning Gas Mains
Four Diagrams (with Explanatory Pamphlet) for determining at a glance the various Problems involved in Proportioning Gas Mains and Services to suit the varying conditions of Diameter, Length, Pressure, Specific Gravity, and Discharge, with Notes as to the allowances to be made for Bends, Branch Mains, and other Disturbing Influences.
By F. SOUTHWELL CRIPPS, Assoc.M.Inst.C.E.
LONDON: WALTER KING, 11, BOLT COURT, FLEET STREET, E.C.

SHEATH BROTHERS, PATENTEES AND MANUFACTURERS.
SOLID INDIA-RUBBER GAS TUBING.
GAS BAGS & GAS ENGINE BAGS.
GAS HOSE.
BRAIDED GAS TUBING.

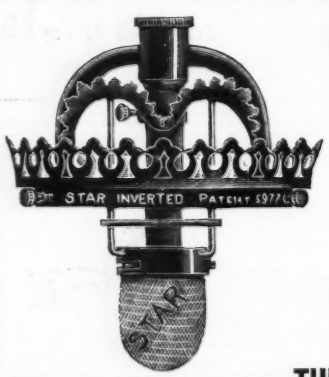

Gas Engine Gas Bags.
Gas Bags.

87, CITY ROAD, LONDON, E.C.


HANNA, DONALD & WILSON, PAISLEY.
ENGINEERS & CONTRACTORS.
ADMIRALTY LIST.
WAR OFFICE LIST.
COLONIAL AGENTS.
ETC.
LARGE CAST IRON OR STEEL OIL, LIQUOR OR WATER TANK.
CONDENSERS VARIOUS TYPES.
GAS AND WATER VALVES.
ROOFING STRUCTURAL W: M.S.& C.I. PURIFIERS.
GAS EXHAUSTER & GAS ENGINE COMBINED.
ROTARY GAS EXHAUSTER.
GASOMETER AND C.I. OR STEEL TANKS.

HISLOP'S PATENT RETORT SETTINGS.
The very best to adopt for Productive Capacity, Economy of Fuel, Durability, and Simplicity of Management.
R. & G. HISLOP, Gas Engineers and Contractors, PAISLEY, N.B.
LONDON: 11, QUEEN VICTORIA STREET, E.C.

THE WIGAN COAL & IRON CO., LIMTD.,
Are exclusive Owners of the well-known HAIGH HALL & KIRKLESS HALL GAS COAL COLLIERIES, and supply the Best Wigan Arley Mine Gas Coal, Gas Nuts, Gas Cannel, Cannel Nuts, &c.
MIDLAND AND WEST OF ENGLAND DISTRICT OFFICE: 6, CORPORATION STREET, BIRMINGHAM—Sole Agent: A. C. SCRIVENER.
Telegraphic Address "WIGAN, BIRMINGHAM." Telephone No. 200.
LONDON DISTRICT OFFICE: 6, STRAND, LONDON—C. PARKER & SON, Sole Agents.
Telegraphic Address: "Parker London."



THE
"STAR" INVERTED
BURNERS & MANTLES.
Patent No. 5977, 1903.
Consumes less Gas than any other Burner known.
Refuse Imitations, and avoid Litigation.
THE BEST IS THE CHEAPEST.
Gives a Brilliant Light of 70-Candle Power.
The MINIATURE ARC LAMP can be supplied in Polished Copper or Coloured Enamel.
Send for Illustrated Price List.

Lamp complete 12s. each. Subject.
Burner and Mantle, 4s. 6d.
Mantles, 6d. each. Subject.
THE STAR INVERTED INCANDESCENT BURNER CO., LIMITED,
104-105, GREAT SAFFRON HILL, LONDON, E.C.

Now Ready, pp. 584 & XVI. 251 Illustrations. F'Cap. Quarto, Price 18s. net (Post Free).

THE SEVENTH EDITION OF

NEWBIGGING'S HANDBOOK

FOR GAS ENGINEERS AND MANAGERS

(DEDICATED TO SIR GEORGE LIVESEY).

The Work has been revised throughout, and contains 40 pages of Letterpress and 12 Illustrations more than the last Edition.

In almost every department additions have been made; and it is believed that the labour bestowed on its production will enhance the value of the book as a Work of Reference.

Orders may be sent through any Bookseller, or direct to the Publisher,

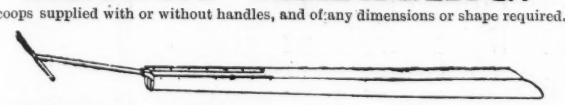
WALTER KING, 11, BOLT COURT, FLEET STREET, E.C.

STEEL SCOOPS

FOR

RETORT CHARGING.

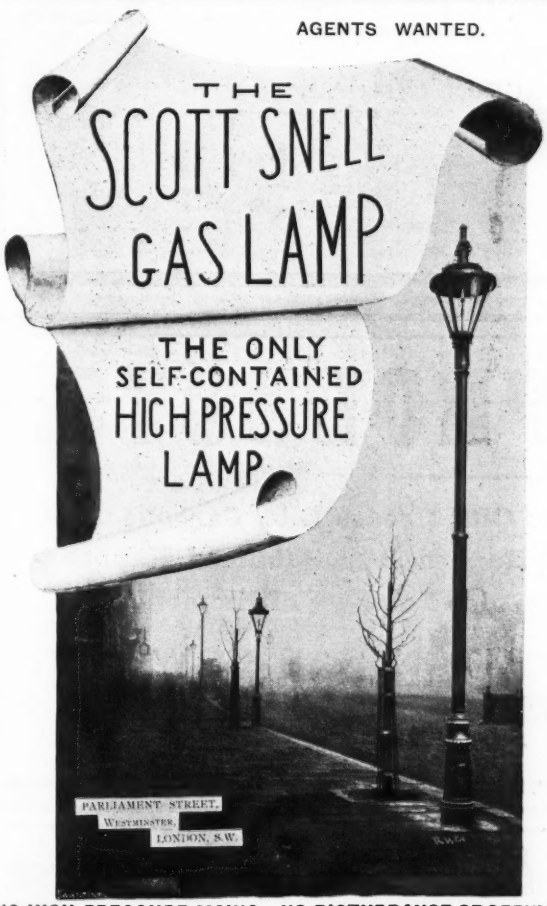
Scoops supplied with or without handles, and of any dimensions or shape required.



HENRY SYKES, Ltd., Engineers,

66, BANKSIDE, LONDON, S.E. Telephone No. 565 HOP.

AGENTS WANTED.



NO HIGH-PRESSURE MAINS. NO DISTURBANCE OF SERVICE.

600 CANDLES can be obtained from a SINGLE BURNER with **15 CUBIC FEET** OF GAS per hour.

The BEST LAMP for:

PUBLIC STREET LIGHTING. SHOPS.
RAILWAY STATIONS. PLATFORMS.
DOCKS. WAREHOUSES. LANDING STAGES.

Special Terms to Gas Companies and Municipal and District Councils.

Illustrated Catalogue and full Particulars on application to

THE SCOTT SNELL SELF-INTENSIFYING GAS LAMP CO., LTD.,

MUNT'S BUILDINGS, 11, ST. JOHN'S HILL,
CLAPHAM JUNCTION, LONDON, S.W.

WE WANT TO MAKE INCANDESCENT MANTLES

FOR YOU.

Before placing any Contracts it will pay you to consult us.

Dr. Alfred Oppenheim & Co.,

General Incandescent Mantle Works,

KREUTZBERGSTR. 36-38, BERLIN, S.W., GERMANY.

Sole Agent for the United Kingdom:

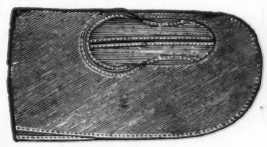
BRUNO SCHOMANN,

23, CHARTERHOUSE BUILDINGS, ALDERSGATE ST., E.C.

THOMAS BUGDEN,

MANUFACTURER OF

TAR and LIQUOR HOSE, and Special AIR TUBING.



BELLOWS made to inflate a 48-inch Bag under One Minute. Various sizes made.

STOKERS' MITTS.
Made from best Tanned Leather.

India-rubber Goods of every description, Leather Bands, Oils, &c., Diving and Wading Dresses, Waterproof Coats and Capes, Sewer Boots, and Theatrical Air-Proof Dresses.

Fire-Engine Hose and Appliances.

Best Materials and Workmanship Guaranteed.

Miners' Woollen Jackets (Also made in Blue Serge.) **No. 1, 12/- each; No. 2, 9/6.**

Gas-Bags for Mains. All Seams Stitched and Taped.

116-118, GOSWELL ROAD, E.C.

Incandescent Mantle Protector.

Protected.

25%

MORE LIGHT

LESS GAS.

NO BURNER COMPLETE WITHOUT.
WILL FIT ANY BURNER.
USED BY THE MILLIONS.

Sample gross 6s., sample half gross 3s. 3d., cash with order. Reductions for Quantities.

Show Cards supplied.

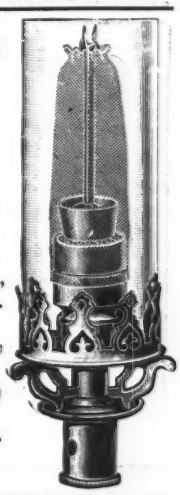
Ask your Wholesaler for a supply, or write to the

Midland Incandescent Mantle Co.,

WOLVERHAMPTON.

London Office: 65, NEWINGTON CAUSEWAY, S.E.

Sole Agent for London:
M. SINGER, 127, WATERLOO ROAD, S.E.



GASHOLDER PAINT SPECIALISTS.

OUR AIM IS QUALITY.

TRADE MARK
SHELL BRAND
REGISTERED.

TO BUY THE PUREST IS THE BEST AND MOST SATISFACTORY.

ALL PAINTS GUARANTEED TO BE GROUND IN PURE LINSEED OIL.

ARCHD. H. HAMILTON & CO.,

Possilpark Paint Works, GLASGOW.

Telegrams: "SATISFY."

"The Catch of the Season"

is undoubtedly the "K" Inverted Burner. It is a marvel of cheapness, simplicity, and efficiency. It gives a wonderful light without coating the Burner with soot. It gives all the advantages of the best Inverted Burners, while obviating their troublesomeness. It is the light for you to push. MOFFAT'S LTD., 155, FARRINGDON ROAD, LONDON, E.C.

COAL TAR PRODUCTS.

Benzol, Toluol, Solvent Naphtha, Creosote Oils, Grease Oils, Carbolic Acid, Crude Creosote Salts, Granulated (Crude) Naphthalene, Sublimed Naphthalene, Anthracene, Refined Tar, Pitch, also Sulphate of Ammonia.

For Prices apply to the **SOUTH METROPOLITAN GAS COMPANY,**

Works: ORDNANCE WHARF, EAST GREENWICH, LONDON, S.E.

709, OLD KENT ROAD, LONDON, S.E.

Telegraphic Address: "METROGAS, LONDON."

GENERAL HEATING & LIGHTING CO., LTD.,

(MOELLER'S SYSTEM),

26, VICTORIA STREET, LONDON, S.W.

MOELLER'S BURNERS

MAINTENANCE SIMPLIFIED.

Nothing to Corrode. Nothing to Choke.
Nothing to get out of Order.

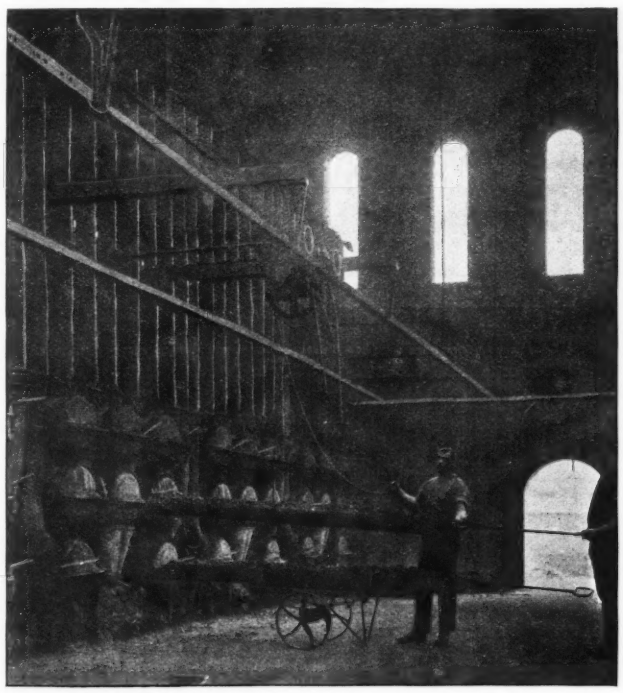
Made in 4 Sizes consuming 3, 4, 4½, and 6½ feet. In Brass or Nickelled.

PRICE LIST ON APPLICATION.

BIGGS, WALL, & CO.,

13, CROSS STREET FINSBURY, LONDON, E.C.

Telegrams: "RAGOUT, LONDON."
Telephone: 273 CENTRAL.



"RAPID"
MANUAL & POWER
CHARGING APPARATUS,
FOR GAS-WORKS OF ALL SIZES.

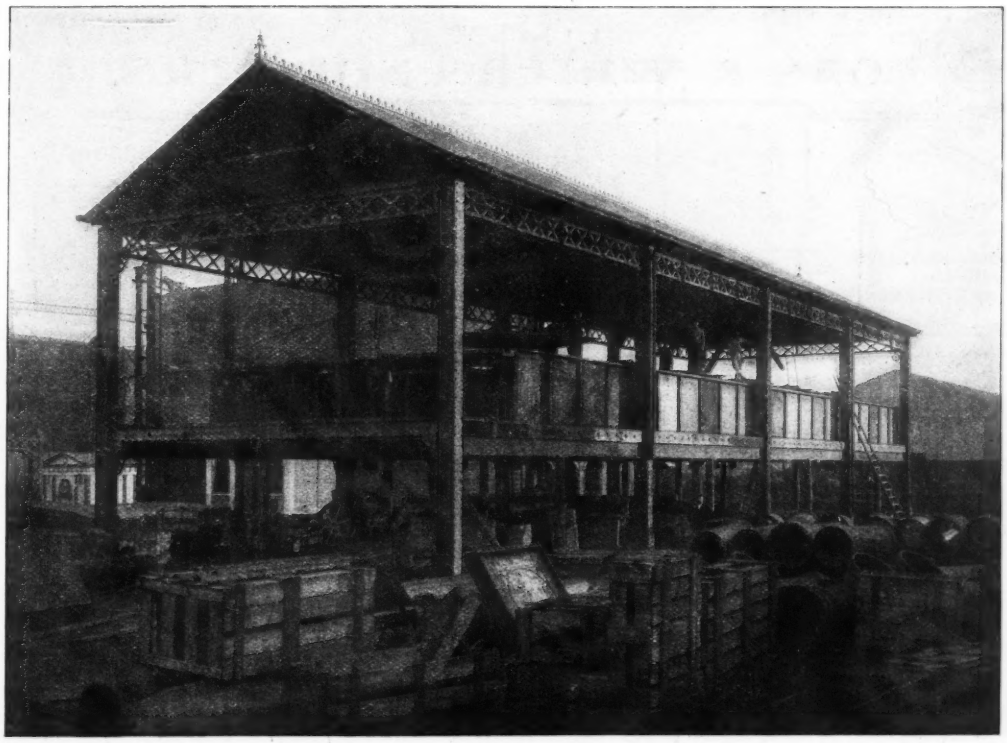
Repeat Orders

YEOVIL, NEWPORT, SOUTHBANK, WORTHING, ALDERSHOT.

Machines can be seen working at any of the following Works:—

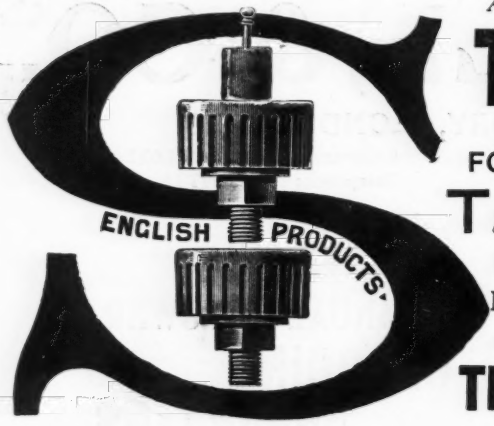
ALDERSHOT	WREXHAM
WORTHING	SWINDON
YEOVIL	EPSOM
TRURO	SHETTLESTON
NORMANTON	DUBLIN
WESTON-SUPER-MARE.	G. S. & W. Rly. Works
GOOLE	NEWPORT, MON.
HARLOW	CLEVEDON

DRAKES LIMITED, HALIFAX.



WE RECENTLY ERECTED THESE 4 PURIFIERS, 30 FEET SQUARE, WITH SUPERSTRUCTURE ROOF AND OXIDE ELEVATOR AND CONVEYOR.

A BOON TO MASTER, MAN, and MACHINE.



STAUFFER'S REG. TRADE MARK.

CENTIGRADE FOR HOT PLACES **LUBRICANT"**

STANDARD MACHINE GREASE.

SAVING UP TO **90** PER CENT. OVER LIQUID OIL.

Patent "Unbreakable" & "Telltale" Stauffer Lubricators.

SOLE MAKERS—

TRIER BROS., 1, GT. GEORGE ST., WESTMINSTER, LONDON.

CUMBERLAND WORKS, NEW CHURCH RD., CAMBERWELL

Every Description of

FIRE-CLAY GOODS

OF BEST QUALITY ONLY.

Personal attention given to all orders.

MOBBERLEY & PERRY,

STOURBRIDGE.

INCLINED AND HORIZONTAL RETORTS of both Taper and Parallel Sections.

SPECIALS FOR WATER GAS PLANTS

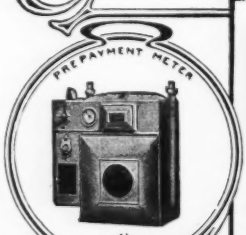
CHECKER BRICKS ALWAYS IN STOCK

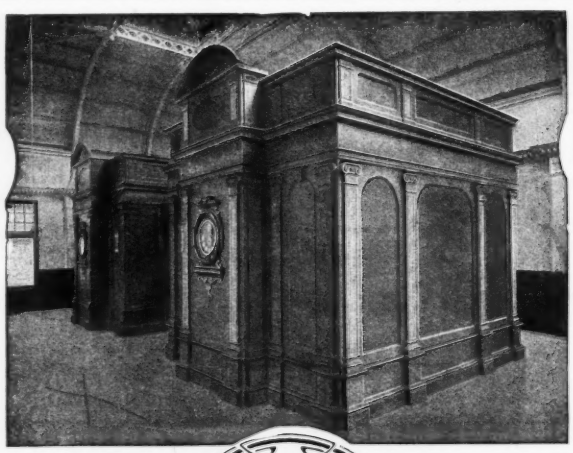
LARGE STOCKS KEPT.

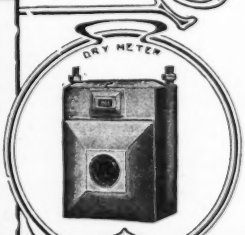
R. LAIDLAW & SON,

LIMITED

GAS & WATER ENGINEERS,



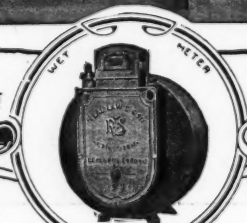




SIMON SQUARE WORKS, EDINBURGH.

6 LITTLE BUSH LANE, LONDON, E.C.

TWO STATION METERS EACH TO PASS 200000 CUB. FT PER HOUR. ERECTED AT THE



GRANTON GAS WORKS FOR THE EDINBURGH & LEITH GAS COMMISSIONERS.

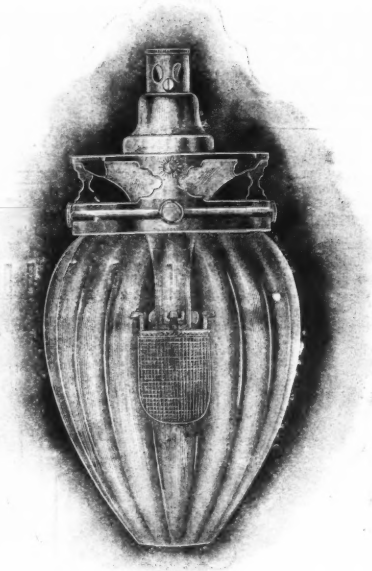
ALLIANCE FOUNDRY & ENGINEERING WORKS, GLASGOW.

THE ORIGINAL NEW INVERTED INCANDESCENT GAS-BURNERS

BRITISH MANUFACTURE.

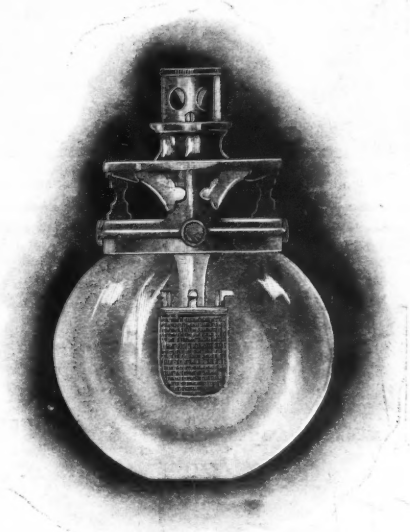
INCREASED DISCOUNTS TO THE TRADE.

New types of BURNERS at popular Prices.



MAXIMUM LIGHT WITH MINIMUM CONSUMPTION OF GAS.

The "Bijou" Burner in clusters for interior lighting has the decorative effect of Electric light at One-Eighth the cost.



No. 2 Burner only, in Polished Brass or Steel Bronze, 4s. 6d. Globes from 6d. each. Mantles 7s. per dozen.

No. 3 Bijou" Burner only, in Polished Brass or Steel Bronze, 3s. Globes from 4d. each. Mantles 6s. 6d. per dozen.

ONLY ADDRESS: **THE NEW INVERTED INCANDESCENT GAS LAMP CO., LD.,**

23, FARRINGDON AVENUE, E.C.

SAML. CUTLER & SONS,

MILLWALL, LONDON.

GASHOLDERS.

STEEL TANKS.

CONDENSERS.

ROOFS.

COLUMNLESS GASHOLDERS WITH CUTLER'S PATENT IMPROVED SPIRAL GUIDE ATTACHMENT.

JÄGER PATENT **PURIFIER GRIDS**

CAPACITY OF PURIFIERS DOUBLED.

PRESSURE CONSIDERABLY REDUCED.

CARBURETTED WATER GAS

Maximum Efficiency Guaranteed.

A LARGE NUMBER OF PLANTS IN OPERATION.

Every Requirement for Gas-Works.

(198.)

F. C. SUGDEN & Co.

CARBONIZING SPECIALISTS.

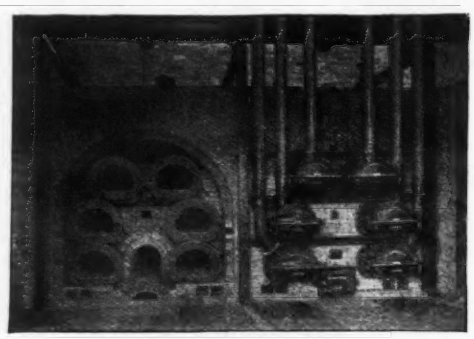


PHOTO. OF REGENERATOR SETTINGS DURING CONSTRUCTION.

REGENERATOR & GENERATOR SETTINGS

DEEP, SEMI-DEEP, AND SHALLOW.

Maximum Make per Ton and Mouthpiece.

Minimum Fuel Consumption.

NUMEROUS REPEAT ORDERS

Have been received for each of the above types of Settings.

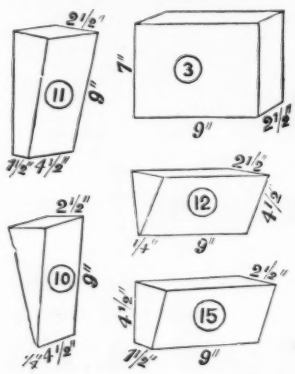
RESULTS GUARANTEED. RETORTS RESET.

SOLE MAKERS OF **CRIPPS' PATENT CHIMNEY.**

Designs and Estimates on application. **28, EAST PARADE, LEEDS.**

STEPHENS & CO., KIDWELLY.

Contractors to a large number of the Principal Gas-Works.



SPECIAL IMPROVED

SILICA BRICKS, BLOCKS, SHIELDS, TILES.

SPECIAL PLASTIC SILICA CEMENT.

Without doubt the finest Materials in the Market for Gas-Works Furnaces.

BRICKS, BLOCKS, TILES, & SHIELDS of any shape made to order.

BUHLMANN MANTLES.

PIONEERS of CHEAP PRICES for BRITISH MANUFACTURE, STRONGEST and BEST for STREET LIGHTING.

SPECIAL PRICES FOR

10 Gross Lots (delivered free).
100 ,, ,, ,, ,, and other Concessions).

— PARTICULARS OF —

THE BUHLMANN INCANDESCENT SYNDICATE, LTD.,

WESTON ST., BROMLEY-BY-BOW, LONDON, E.

GAS
THE WINSTANLEY SPECIALTY COY.
ENGINEERS

GAS ENGINEERS.

CONTRACTORS FOR, AND ERECTORS OF, ALL GAS-WORKS PLANT.

REGENERATORS, GENERATORS, AND DIRECT-FIRED RETORTS.

RESULTS GUARANTEED.

COMPLETE INSTALLATIONS OF HORIZONTAL AND INCLINED RETORTS.

ADDRESS—

NEWTON CHAMBERS, CANNON ST., **BIRMINGHAM.**

BOWENS' Ltd. Successors,
STOURBRIDGE.

MANUFACTURERS OF
BEST FIRE-BRICKS; INCLINED, HORIZONTAL, and SECTIONAL RETORTS; LUMPS, TILES, &c., of every description.
ESTABLISHED 1860.

CLAYTON SON & Co LTD
LEEDS
MAKERS OF THE LARGEST GASHOLDER IN THE WORLD ALSO
THE ORIGINAL MAKERS OF
SPIRAL GUIDED GASHOLDERS
MAKERS OF ALL KINDS OF STRUCTURAL IRON & STEEL WORK. STEEL FRAMED BUILDINGS ROOFS RETORT FITTINGS PURIFIERS RETORT LIDS ANTIFREEZERS for Gasholders
STEEL TANKS
OF ALL SIZES
MAKERS OF THE LARGEST IN THE WORLD.
GASHOLDERS
OF EVERY DESCRIPTION & SIZE
HIGH CLASS BOILERS FITTED WITH
DEIGHTONS CORRUGATED FLUES.
Telegrams "GAS LEEDS." London Office 60 Queen Victoria St E.C.

MANNESMANN

LAMP POSTS

made throughout of
WELDLESS STEEL TUBING
including base, ring, and ladder rest.

Light, Strong, Unbreakable, and Cheap.

GAS, WATER, & STEAM TUBES AND FITTINGS.

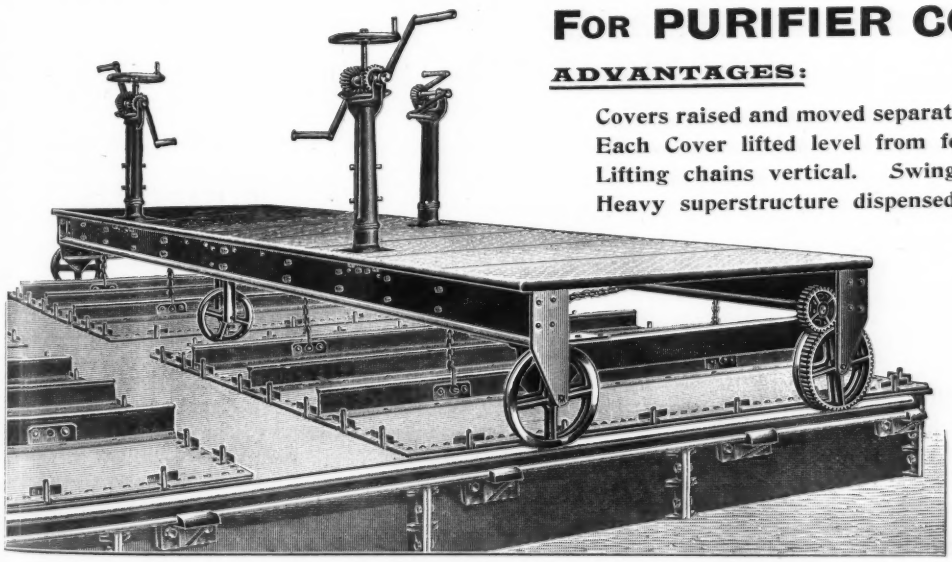
WELDLESS STEEL
SPIGOT & FAUCET PIPES
for Gas and Water Mains.

Tubes can be supplied up to 10 inches diameter and in lengths up to 40 feet.

THE BRITISH MANNESMANN TUBE COMPANY, LTD.,
110, CANNON ST., LONDON, E.C.
Birmingham Depôt: Bridge Works, LISTER ST.
Works: LANDORE, SOUTH WALES.

R. & J. DEMPSTER, Ltd.,
Telegraphic Address: "SCRUBBER MANCHESTER." **MANCHESTER.**

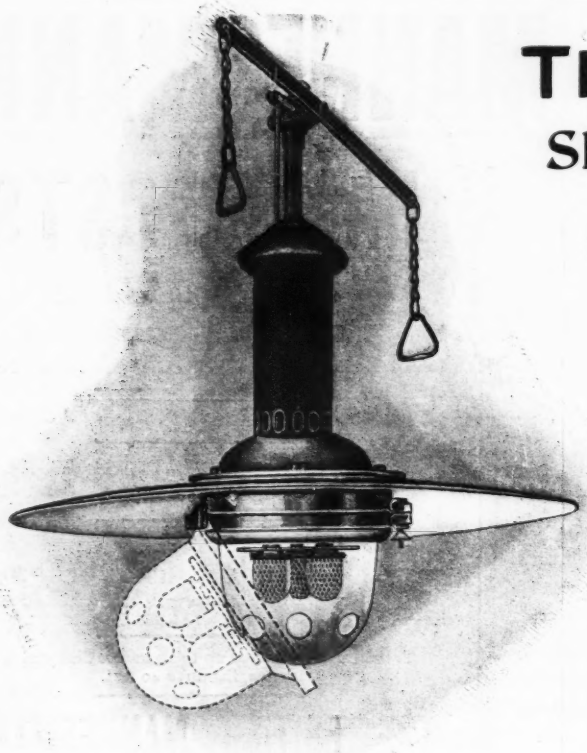
HOVEY'S PATENT LIFTING CRANE
FOR PURIFIER COVERS.



ADVANTAGES:
Covers raised and moved separately or Two together.
Each Cover lifted level from four points.
Lifting chains vertical. Swinging avoided.
Heavy superstructure dispensed with.

Prices and Particulars on Application.

London Office: 165, GRESHAM HOUSE, OLD BROAD STREET, E.C.



The "DRURY"

Shadowless Inverted Cluster Lamp.

PATENTED AND REGISTERED.

A very efficient Lamp for all Buildings where a good downward light is wanted.

The special feature of the "**Drury**" Inverted Cluster Lamp is the way in which a cluster of Three Inverted Mantles is suspended from an interior white enamelled plate. The Three Mantles are arranged so close together that they have the appearance of one large brilliant Incandescent Ball, giving a surprising effect of its lighting power.

The Lamp is provided with a small interior Bye-Pass. Only "**Drury**" Mantles should be used to obtain the best effect, as they have a special Registered Holder which ensures the Mantles keeping a central position.

No. 2203. For Indoor use, 49s. 6d. Complete with Mantles, as shown. Extra Mantles, 7s. per dozen.

EVERED & CO., LIMITED,

27 to 35, Drury Lane, London, W.C., & 143, High Street, Shoreditch, E.

Works: SURREY WORKS, SMETHWICK, near BIRMINGHAM.

Telephone No. 3. Telegraphic Address: "ELEVATOR, HASLINGDEN."

S. S. STOTT & CO.,

ENGINEERS, HASLINGDEN, NR. MANCHESTER.

COAL AND COKE ELEVATORS AND CONVEYORS.

COAL AND COKE STORAGE PLANTS.

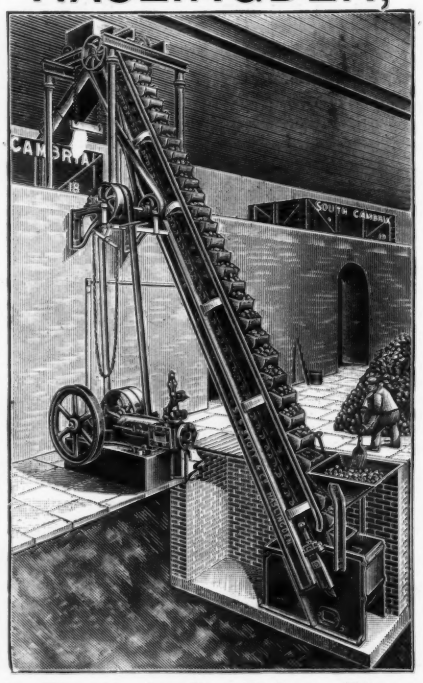
COAL AND COKE BREAKERS.

WHARF ELEVATORS for UNLOADING BARGES.

ELEVATORS AND CONVEYORS for BOILER-HOUSES.

STAMPED AND RIVETED STEEL ELEVATOR BUCKETS.

DETACHABLE CHAINS and SPROCKET WHEELS.



Coke Elevator Loading Railway Waggons.

LIME AND OXIDE ELEVATORS AND CONVEYORS.

HIGH-CLASS **STEAM-ENGINES** up to 1000-Horse Power.

PUMPS, HORIZONTAL AND VERTICAL, SINGLE, DOUBLE, or THREE-THROW, for WATER-WORKS, &c.

BEAM PUMPING-ENGINES.

AIR-COMPRESSORS.

BELT PULLEYS, ROPE PULLEYS, GEARING, &c., &c.

Printed for WALTER KING by King, Sell, & Olding, Ltd.; and published by him at 11, BOLT COURT, FLEET STREET, in the CITY OF LONDON.—Tuesday, Feb. 14, 1905.